

# **Diet Composition and Habitat Fidelity for Groundfish Assemblages in Hecate Strait, British Columbia**

I.A. Pearsall and J.J. Fargo

Fisheries and Oceans Canada  
Science Branch, Pacific Region  
Pacific Biological Station  
Nanaimo, British Columbia  
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DIET COMPOSITION AND HABITAT FIDELITY FOR GROUND FISH  
ASSEMBLAGES IN HECATE STRAIT, BRITISH COLUMBIA

by

I. A. Pearsall<sup>1</sup> and J.J. Fargo<sup>2</sup>

<sup>1</sup> Pearsall Ecological Consulting  
99 Machleary Street  
Nanaimo, B.C. V9R 2G3

<sup>2</sup> Fisheries and Oceans Canada  
Science Branch, Pacific Region  
Pacific Biological Station  
3190 Hammond Bay Road  
Nanaimo, B.C., V9T 6N7

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## **Abstract**

Pearsall, I. A., and Fargo, J.J. 2007. Diet composition and habitat fidelity for groundfish assemblages in Hecate Strait, British Columbia. Can. Tech. Rep. Fish. Aquat. Sci. 2692: vi + 141 p.

Here we present an analysis of ontogenetic, seasonal and spatial patterns in diets of groundfish species from Hecate Strait, British Columbia. A total of 6322 stomachs were collected from 30 groundfish species over three cruises carried out between 1985 and 1987. Five main feeding strategies were identified: euphausiid feeders, shrimp feeders, benthic (macrobenthic- mainly crabs and bivalves; and meiobenthic- primarily annelid) feeders, macrobenthic feeders (mainly) and piscivores. Benthic feeders showed more diet stability and habitat fidelity as compared with piscivores. In addition, ontogenetic changes were more apparent for piscivores rather than the benthivores. Diet breadth and the proportion of fish in diets was greater over the fall and winter as compared to the summer. Possible competitive and predator-prey interactions are discussed and the impact of abundant transient species such as dogfish on community structure are examined.

## Resume

Pearsall, I. A., and Fargo, J.J. 2007. Diet composition and habitat fidelity for groundfish assemblages in Hecate Strait, British Columbia. Can. Tech. Rep. Fish. Aquat. Sci. 2692: vi + 141 p.

Nous présentons une analyse des profils ontogénétique, saisonnier et spatial de l'alimentation chez diverses espèces de poisson de fond trouvées dans le détroit d'Hécaté, en Colombie-Britannique. Un total de 6 322 estomacs ont été prélevés chez 30 espèces lors de trois croisières de recherche effectuées entre 1985 et 1987. Ces espèces se divisent en cinq grandes catégories selon les proies consommées : euphausiacés, crevettes, organismes benthiques (macrobenthiques- principalement des crabes et des bivalves et méiobenthiques- principalement des annélidés), organismes (principalement) macrobenthiques et poissons. Les benthivores avaient un régime plus stable et ils étaient plus fidèles à leur habitat que les piscivores. De plus, les changements ontogénétiques étaient davantage évidents chez les piscivores que chez les benthivores. La variété des aliments et la proportion de poissons consommés étaient plus grandes en automne et en hiver qu'en été. Nous examinons les interactions concurrentielles et les interactions prédateur-proie possibles, ainsi que l'impact d'espèces de passage abondantes, tel l'aiguillat, sur la structure des communautés.

## Introduction

Between 1984 and 1987, a number of studies were carried out to examine stomach contents of groundfish species in northern Hecate Strait, which is the body of water lying between the Queen Charlotte Islands and mainland north coast of British Columbia, Canada. The data collected on a multispecies survey during the Hecate Strait project, with goals of providing catch rate data useful for indexing the abundance of as many marine fish species as possible and the development of an ecological basis for alternative mixed-species assessment techniques (Tyler 1986, 1989; Tyler et al. 1986). Stomach contents were collected to examine species interactions, and to assess spatial and temporal differences among habitats within the study area.

More than 100 species of groundfish are resident in the Strait, including 17 of the 21 species of flatfish in British Columbia. A small mixed fishery exists in this region, landing an average of about 5000 tonnes annually. The principal commercial species are Pacific cod (*Gadus macrocephalus*), English sole (*Parophrys vetulus*) and rock sole (*Lepidopsetta bilineata*) (Fargo et al. 1990). Dover sole (*Microstomas pacificus*), petrale sole (*Eopsetta jordani*) and Pacific halibut (*Hippoglossus stenolepsis*) are also target species and several other species are also caught and landed as incidentals, including sand sole (*Psettichthys melanostictus*), starry flounder (*Platichthys stellatus*) and arrowtooth flounder (*Atheresthes stomias*). Pacific sanddab (*Citharichthys sordidus*), butter sole (*Iopsetta isolepsis*), rex sole (*Glyptocephalus zachirus*) and flathead sole (*Hippoglossoides elassodon*) are discarded due to their small size. Long-term monitoring of these groundfish species has taken place since 1984 as part of the Hecate Strait multispecies survey (Fargo et al. 1990).

Fish communities have been previously identified in Hecate Strait. These communities are dominated by flatfish species which can be characterized by depth and bottom type (Fargo and Tyler 1991). The different bottom types and depths will affect not only the fish species present, but also the types of prey that will be available (Burd and Brinkhurst 1987). Fish diets may be affected by several factors, including 1) spatial and seasonal patterns of habitat use, which will influence the types of prey available, 2) prey preference, and 3) intra and inter-specific competition for the same prey items. We were interested in elucidating the trophic interactions among groundfish in Hecate Strait, and using the diet information to assist in the modeling this ecosystem (Walters et al. 2000).

Two cruises (June and September-October 1985) collected data on groundfish food resource division (Saunders et al. 1986). A third cruise was carried out in January 1986, to identify winter components. In 1987 the work was repeated although at a reduced rate (Foucher et al. 1988; Fargo et al. 1988). Thirty species of groundfish were collected from four sampling areas (A,B,C and D), and three of these corresponded with groundfish assemblage areas as described by Fargo and Tyler (1991).

Stomach samples were collected on board, stored in formalin, and analyzed at a later date in the laboratory. The stomach content data collected were stored as ASCII files, but no detailed statistical or exploratory analyses were performed on the resulting data sets, until this study was carried out during 2002.

The major focus of this paper is to describe the diet of marine fish in Hecate Strait including its ontogenetic, seasonal and spatial variation. We also examine the spatial and temporal overlap of the fish species to elucidate the possible competitive and predator-prey interactions that may take place in Hecate Strait. We compare the benthic organisms found within the diets of the benthivores with those species identified most commonly in sediment samples collected within the Strait (Burd and Brinkhurst 1987). Using these results, we discuss the relationships between habitat affinity and feeding preferences. We also identify transient species and use the information on feeding ecology to suggest how the food habits of these species may alter community structure.

Diet data were incorporated into an Ecopath model (Christensen and Pauly 1992a&b, 1993) for the Hecate Strait ecosystem. The Ecopath software is based on early work by Polovina (1984) and is a mass-balance approach that provides a static snapshot view of an ecosystem at steady state during a given period. It is widely used to analyze trophic interactions in fisheries resource systems as well as to determine of the trophic flows required to support the current ecosystem trophic structure. We use a balanced Hecate Strait Ecopath model to further examine the trophic relationships and associations between species that result from the diet linkages.

## Methods

### AREAS OF STUDY

Stomach samples were collected from four areas of Hecate Strait (A, B, C and D; Figs. 1&2), which were deemed to be representative of habitat for the four major groundfish assemblages (Fargo and Tyler 1991). The dimensions of each sampling area were 3 by 3 nautical miles except for one area (A) which was 1.6 by 6nm (this was a very narrow band because of steepness of the edge). Burd and Brinkhurst (1987) described the four sampling areas A, B, C and D. Area A, the "Butterworth" had depths of 55-166m, the bottom substrate was made up of sandy silt, and there was strong tidal movement through the area. Area B, "Reef Island" had the shallowest depths of 18-70m and substrates of fine sand and a lot of shell debris. This area had the highest sand content of the four areas. Sediment varied the most in Area C, with cobbles, gravel and pebbles, to silty sand on the western side of the area, and sandy silt on the eastern side. The sand was much coarser than in area A. Depths in this area ranged from 55-159m. In area D "Bonilla", the substrates were sandy, ranging from fine, silty sand to coarser sand. Depths here ranged from 55 to 108m. Areas A and C had the highest silt contents and areas B and D were similar with some areas of high gravel content.

In June and September 1985 three of the areas (A-C) within northern Hecate Strait were sampled and in September the fourth area (D) was added to complement area C since juvenile English sole was almost absent from this area. In 1986, and 1987, sampling was carried out in all four areas.



## HAULS CARRIED OUT AND NUMBERS OF FISH PRESERVED

Diel sampling took place in area A in the June 1985 cruise and in areas B and C in the September 1985 cruise. Hauls were made every six hours starting at 0800. Except for these cruises, all fishing was done during daylight hours.

Trawls were made over a period of 30 minutes and the total catch from a minimum of two hauls in each area was sampled for species composition and stomach contents. If time permitted further hauls were carried out specifically to increase the sample sizes for infrequently occurring species such as halibut and skates.

Between 2-7 trawls were carried out in each Area during each cruise, except for June 1985, when no hauls were made in Area D. Stomachs from fish collected in the 4 sampling areas were preserved. Stratified samples of 10 stomachs, containing food, per 10 cm length interval for each species were taken. Stomachs were removed from the fish by cutting the esophagus as close as possible to the mouth and cutting the intestine just posterior to the stomach. Records of fish lengths and the incidence of empty stomachs were kept.

The numbers of stomachs processed were 2206 for cruise 1, 2675 for cruise 2, 1301 for cruise 3, and 138 from cruise 4. Although stomachs from 23 different species were stored from cruise 4, only stomachs of Pacific cod and dogfish were processed.

The total numbers of stomachs processed by area were 1728 for Area A, 1423 for Area B, 2427 for Area C and 744 from Area D (Table 1). Overall, most stomachs were processed for arrowtooth flounder (977), spiny dogfish (844), Pacific cod (573), rex sole (583), ratfish (572) and English sole (433). Only 1 curlfin sole, 3 starry flounder, 4 *Sebastes elongatus*, 6 butter sole, and 8 *Sebastes paucispinus* stomachs were processed. All the sablefish captured were juveniles.

## DATA ANALYSIS

The 730 diet items were separated taxonomically and grouped as shown in Table 2. We termed these groupings "Ecopath groups" since the diets were partitioned into groupings we chose to use in the Ecopath model. However, each of these "Ecopath groups" were further subdivided into "Ecopath Sub Groups" so that diets could be analysed at a higher resolution. For example, the commercial shrimp category was made up various pandalid species, namely, the ocean shrimp (*Pandalus jordani*), dock shrimp (*P. danae*), yellowleg pandalid (*P. tridens*) and the spot shrimp (*P. platyceros*). Epibenthos included barnacles, isopods, leptostraca, mysids, shrimp (non-commercial) and tanaidaceans. The euphausiid category was made up of *Euphausia pacifica*, *E. pseudogibba*, *Thysanoessa marura*, and *T. spinifera*. Forage fish was made up of sandlance (*Ammodytes hexapterus*) and eulachon (*Thaleichthys pacificus*). The jellies/macrozooplankton included thecate hydroids, medusae, and pelagic tunicates. The "Inshore rockfish" group was comprised of various *Sebastes* species and scorpionfishes. Macrobenthos was the largest group of all, encompassing anomurans, aplacophora, ascidians, bivalves, branchiopods, chaetognaths, cnidaria, crabs, unidentified large crustacea, echinoderms, echiurans, gastropods, horseshoe crabs, lophophorans, molluscs, peanut worms, polyplacophora, priapulans, prosobranchs, reptantia and sponges. The meiobenthos found in stomachs included annelids, bryozoans, nematodes, nudibranchs and proboscis worms. The "other flatfish" grouping was made up of

unidentified flounders, (e.g. flathead sole, sand sole, slender sole, yellowfin sole) and unidentified sanddabs. The predatory invertebrates included various unidentified octopus species, including the giant octopus *Octopus dofleini*. The predatory mesozooplankton category included amphipods, caprellid amphipods, arrow worms, cumaceans, gammarids, hyperid amphipods, megalops, ostracods and zoea. The shallow water benthic fish grouping included poachers (Agonidae), clingfishes, eelpout, gadids, gobies, greenlings, lamprey, lumpfishes, pacific tomcod, perch, pholididae, pricklebacks, sandfishes, sculpins, smelt, snailfishes and blennies. The squid group included various unidentified *Loligo* species, including the California market squid, *Loligo opalescens*. The transient salmon group was made up of sockeye (*Onchorynchus nerka*), chum (*O. keta*) and pink salmon (*O. gorbuscha*). When the stomach contents had been analysed in the late 1980's, taxonomic specialists for annelids, gammarids, bivalve molluscs and gastropod molluscs were employed, and thus these groups are particularly well described to the species level. However, for many of the other diet components, broader categories were employed, and often identification only took place to the genus level, resulting in substantial variation in data resolution among diet groupings.

A number of queries were performed to analyze the proportion that the different prey groups contributed to each fish diet. Mean proportion of any one prey species *f* in a predator species *p* diet ( $\bar{P}_{fp}$ ) would be given as follows:

$$(1) \quad \bar{P}_{fp} = \frac{W_{fp}}{W_p}$$

where weight of prey species *f* in all stomachs of predator species *p* ( $W_{fp}$ ) is given as:

$$(2) \quad W_{fp} = \sum_i W_{fpi}$$

weight of all stomach contents of predator species *p* ( $W_p$ ) is given as:

$$(3) \quad W_p = \sum_f W_{fp}$$

Thus, all the stomach content data for any one predator species were pooled and the proportions of each prey were determined using the pooled data.

All diet analysis was based on relative contribution by weight, with diet items with weights less than 0.0005g omitted from the analyses. Weights of internal parasites and unidentified matter were also removed from analyses.

Diet analyses for dogfish did not incorporate any prey items that were suspected to have been taken within the trawls because of the opportunistic nature of this species, which possibly results in substantial net feeding.



Diets were determined by cruise and by area within Hecate Strait so that seasonal and spatial variability in diets could be examined. Diets for some of the most important commercial species in Hecate Strait, namely, arrowtooth flounder, English sole, Dover sole, rock sole, Pacific ocean perch and Pacific cod, were analyzed for both adult and juvenile stages. Fish with total lengths below 40cm for arrowtooth flounder, 34.3cm for English sole, 39cm for Dover sole, 34.5cm for rock sole, 81 centimetres for dogfish and fork lengths of 30cm for Pacific ocean perch, 50cm for Pacific cod were considered juveniles.

Cluster analysis was employed to examine similarities in diet among the different fish species (except for butter sole, curlfin sole and starry flounder for which the number of stomachs sampled was deemed too low). We used complete linkage clustering employing the Euclidean distance (ie a hierarchical technique) and we compared fish species based on the proportion of the diet made up of the Ecopath Sub Groups (described above). Average linkage clustering was developed to avoid the extremes introduced by single linkage and complete linkage clustering. The method uses an unweighted pair-group method using arithmetic averages (UPGMA) for which the definition is: {similarity between a sample and an existing cluster} = {arithmetic mean of similarities between the sample and all the members of the cluster}.

To examine the potential competition among the species in the different clusters, the top ten dietary components by weight were compared. We also examined the spatial and seasonal variability in the diets of the different fish species sampled during the four cruises. We expected some similarities in diet among the two summer cruises but different diets during the fall and winter cruises.

Finally, the benthic organisms found within the diets of the benthivores English sole, rex sole, and Dover sole were compared with the primary benthic organisms identified as most common within each spatial area (A-D) (Burd and Brinkhurst 1987; Table 11). Habitat fidelity and diet breadth were examined with respect to feeding strategies.

In our discussion, the spatial and depth distributions of the fish were examined in relation to their diet composition to elucidate the possible competitive and predatory interactions that could occur among species.

## ECOPATH MODELING

The diet data for the groundfish species covered in this report were inserted into an existing Ecopath model for the Hecate Strait ecosystem (Pearsall, Fargo & Sinclair, in prep.). Using this modelling software, the Hecate Strait ecosystem was modelled using a set of simultaneous linear equations for each of 46 functional groups (single species or groups of functionally related species) in the model:

Production by (i) - all predation on (i) - nonpredation losses of (i) - export of (i) = 0, for all (i)

The inputs for this model are estimates of biomass, production/biomass ratios, consumption/biomass ratios, export (emigration), ecotrophic efficiency, and diets for each group. Ecotrophic efficiency is the amount of production that is either that is consumed within the system or harvested (by fisheries). The equation above applies to each producer resulting in a series of linear equations which may be solved by matrix inversion. When balancing the energy flow of each box, however, another equation must also be taken into account:

$$\text{Consumption} = \text{production} + \text{non-assimilated food} + \text{respiration}$$

Note that the period for the model may be any period of time (e.g. one year, one season, one decade), so long as the biomass at the beginning and end of the period is the same. The two equations work on the principle of mass-balance, that is, all biomass is conserved or accounted for within the system (there is no net gain in biomass). This requirement sets boundaries for the series of linear equations by which all the species are interrelated, and thus, the biomass and trophic fluxes between different groups within the ecosystem can be determined.

We produced a balanced model for the Hecate Strait ecosystem and used it to examine the trophic levels of the groundfish species detailed in this report in relation to the trophic levels of other members of their ecosystem, as well as to examine the possible direct and non-direct interactions that could result in the food web based on the diet linkages. We examined mixed trophic impacts as an output from the Ecopath software: such a diagram can be used to examine the relative impacts of any one group on other functional groups. The bars in impact diagrams show relative, not absolute, impacts, but are comparable between groups (Christensen, et al., 2000). Bars pointing downwards indicate negative impacts, whereas positive impacts (beneficial predation) are shown by bars pointing upwards. In this latter case, the negative direct impact on prey may be reduced by indirect positive impacts, resulting, for example, when a predator feeds on another predator or competitor of the prey.

The final Ecopath output examined were predator and prey overlaps.

This is defined as the overlap that any two species have in their predators, whereas the prey overlap is the overlap between any two species in terms of the prey that they have in common (Christensen, et al., 2000). Prey overlap ( $O_{jk}$ ) is expressed as a modified Pianka (1973) index and is given as:

$$O_{jk} = \sum_{i=1}^n (P_{ji} \cdot P_{ki}) / (\sum_{i=1}^n (P_{ji}^2 + P_{ki}^2) / 2)$$

Here,  $P_{ji}$  and  $P_{ki}$  are the proportions of resource  $i$  used by species  $k$  and  $j$ , respectively. The resulting index is symmetrical, with values ranging from 0 (no overlap in the prey base) to 1 (complete overlap in prey eaten).

Using a similar approach, the amount of predation on preys  $m$  and  $n$  by all predators,  $l$ , is given by:

$$P_{mn} = \sum_{i=1}^n (X_{mi} \cdot X_{ni}) / (\sum_{i=1}^n (x_{mi}^2 + x_{ni}^2) / 2$$

This index values also range between 0 and 1, from no overlap of predators for the two prey types, to complete overlap of predators.

## Results

Appendices 1 and 2 show fish diets analysed for all data combined (i.e. all cruises and areas pooled) for Ecopath groups (Appendix 1) and Ecopath subgroup levels (Appendix 2). Appendices 3 and 4 show these same results analyzed separately by cruise and area.

The most highly sampled species of fish in each area A,B,C and D were those characteristic of the fish assemblages of each of those areas (Fargo and Tyler 1991). In Area A, the most highly sampled species were arrowtooth flounder and ratfish, characteristic of the Butterworth assemblage. In Area B, the most highly sampled species were rock sole and dogfish, both characteristic of the Reef Island assemblage. In Area C, there were many different species sampled but Pacific ocean perch (*Sebastes alutus*) was more common in this area as compared to the other three areas, somewhat indicative of the Moresby Gully rockfish assemblage. Finally, English sole and Pacific cod were most commonly sampled in area D, both indicative of the Bonilla assemblage.

### PRIMARY DIET COMPONENTS OF FISH SPECIES

The fish species were initially split into groups by feeding characteristics, grazers, piscivores or planktivores. The primary diet components are listed in Table 3 below. Interpretation of the diets of the piscivores was somewhat complicated by the prevalence of unidentified fish in the stomachs. The top predators (based on proportion of fish in diet) appeared to be dogfish, adult Pacific cod, adult arrowtooth flounder, petrale sole, Pacific halibut, silvergray rockfish, lingcod and sand sole (Table 4). Butter sole also showed piscivorous habits but the sample size for this species was very low so it is not included in any further analyses. Adult arrowtooth flounder and adult Pacific cod fed on a greater proportion of fishes than did juveniles of the same species. Black skate, ratfish, walleye pollock, Pacific ocean perch, yellowtail rockfish, Pacific sanddab, Dover sole and rex sole all ate minimal amounts of fish in their diet. Most of the piscivores fed on forage fish, herring, other flatfish, and shallow water benthic fish (Table 4). Petrale sole showed the highest dependence on herring.

Different *Sebastes* species did show some differences in their diets. Euphausiids made up between 58% and 90% of the diet components for Pacific ocean perch, greenstripe rockfish and yellowtail rockfish. Bocaccio rockfish was different in that it appeared to feed primarily on fish (99% of its diet was made up of fish) and the redbanded rockfish also showed differences in diet selection, feeding primarily on macrobenthos and shrimp. Silvergray rockfish (*S. brevispinis*) fed mainly on fish (74% of diet) but also fed on euphausiids.

Of the flounders, rex sole, English sole, butter sole, Dover sole, rock sole, and flathead sole all showed some similarity in diet components, feeding primarily on macrobenthos, forage fish, meiobenthos and epibenthos in varying amounts. The three skates, big skate, black skate and longnose skate, also showed similarity in diets, all feeding largely on macrobenthos, although black skate also fed on a substantial amount of non-commercial shrimp species (within the epibenthos category).

Overall Pacific cod appeared to have the most varied diet, together with arrowtooth flounder and dogfish, all piscivores. The least varied diets were exhibited by the planktivore Pacific ocean perch, and two benthivores, English sole and Dover sole.

#### **ONTOGENETIC CHANGES IN DIET**

Ontogenetic shifts in diet were apparent for most of the 6 species for which the diets of juveniles and adults were compared (Figs. 3-8). For Pacific cod, adults and juveniles both focussed primarily on forage fish, other flatfish and herring, but juveniles appeared to concentrate more on macrobenthos and shrimp than the adults (Fig. 3).

Adult Pacific ocean perch fed almost completely on euphausiids (Fig. 4). The proportion of euphausiids was reduced in the diet of juveniles, and there was greater dependence on macrobenthos and copepods.

Adult arrowtooth flounder fed primarily on fish, including forage fish and herring (Fig. 5). Juvenile arrowtooth flounder also fed primarily on fish, but fed less on forage fish than adults, and ate greater amounts of macrobenthos than adults, as well as more euphausiids and shrimp.

Adult rock sole fed largely on meiobenthos and macrobenthos, as well as forage fish (Fig. 6). Juveniles also appeared to concentrate on these same items but did also have a higher proportion of forage fish in their stomachs.

Both adult and juvenile Dover and English sole fed mainly on meiobenthos and macrobenthos (Figs. 7&8). Adult and juvenile Dover sole diets were almost identical. Juvenile English sole did have a greater proportion of forage fish in their diet than adults, but the diets were still very similar.

Adult and juvenile dogfish showed differences in diet. Juveniles concentrated less on fish (50.4% of diet made up of fish) as compared to adults (80.7% of diet made up of fish), and fed more on macrobenthos and epibenthos than did adults (Fig. 9).

#### **CLUSTER ANALYSIS**

Adult and juvenile English sole clustered closely as did adult and juvenile Dover sole, which would be expected based on the similarity of their diets (Fig. 10). Overall, the main clusters appeared to be:

1. Adult and juvenile Pacific ocean perch, eulachon, yellowtail rockfish, sablefish, Pacific sanddab and greenstriped rockfish;

2. Dover sole (adult and juvenile), English sole (adult and juvenile), rex sole, adult rock sole;
3. Big skate, longnose skate, redbanded rockfish, Pacific halibut and ratfish; with speckled sanddab and black skate grouping more loosely with this cluster;
4. Arrowtooth flounder (adult and juvenile), petrale sole, dogfish, and silvergray rockfish; and
5. Walleye pollock, speckled sanddab
6. Pacific cod (adult and juvenile), sand sole and juvenile rock sole

Fig. 11 shows the adult and juvenile Pacific ocean perch, eulachon, yellowtail rockfish, sablefish, greenstriped rockfish and Pacific sanddab cluster. We categorized this group as euphausiid feeders.

Fig. 12 shows the cluster made up of Dover sole (adult and juvenile), English sole (adult and juvenile), rex sole, adult rock sole. This group of benthic feeders focussed almost completely on macrobenthos and meiobenthos.

Fig. 13 shows the big skate, longnose skate, redbanded rockfish, Pacific halibut and ratfish cluster. This group of benthic feeders focuses primarily on macrobenthos as well as small amounts of fishes and does not appear to feed on meiobenthic components as with the previous cluster. Although Pacific halibut was earlier identified as a piscivore because of the presence of fish in its diet, the high proportion of macrobenthos taken by this species placed it together with the other macrobenthic feeders with the cluster analysis. Although speckled sanddab and black skate did cluster fairly loosely with this group, they appeared to focus more strongly on epibenthic groups. When we examined the particular epibenthic groups on which they fed, we found that they chose non-commercial shrimp, which are included in the epibenthic category. Thus we placed these two species with walleye pollock and flathead sole in Fig. 15 discussed below.

Fig. 14 shows the arrowtooth flounder (adult and juvenile), petrale sole, dogfish, lingcod and silvergray rockfish cluster. This group may be categorized as piscivores.

Fig. 15 shows the walleye pollock, flathead sole, speckled sanddab and black skate cluster. This group focuses mainly on shrimp and epibenthos, as well as lesser amounts of macrobenthos. Walleye pollock and flathead sole fed mainly on commercial shrimp, whereas speckled sanddab and black skate fed on non-commercial shrimp species. The separation of shrimp into commercial species (placed in the commercial shrimp group) and the non commercial species (into epibenthos) was not done for biological reasons, but rather for the purposes of the Ecopath model. Further discussion groups these four species as shrimp/epibenthic feeders.

Finally, Fig. 16 shows the adult and juvenile Pacific cod, sand sole and juvenile rock sole cluster. Again, these species appear to be piscivores, but they did not cluster as closely with the other piscivores (feeding on unidentified fish) since stomach contents in this case were clearly identified as forage fish.



Clusters 2 and 3 focus on benthic groups. Figs. 17-18 show the breakdown of the specific benthic groups (Macrobenthos and Meiobenthos subgroups) upon which these species feed. Clear differences are apparent among the groups. Adult rock sole, rex sole, Dover sole adults and juveniles and English sole adults and juveniles focus primarily on annelids (meiobenthos), but also on echinoderms, echinurans, and cnidaria. Big skate, longnose skate, redbanded rockfish, Pacific halibut and ratfish primarily focus on crabs as well as lesser amounts of bivalves and anomurans. In order to distinguish between these two groups, we identify the former group as "annelid feeders" and the latter group as "crab feeders".

In the case of the piscivores, herring showed up as a primary diet component for arrowtooth flounder, lingcod, Pacific cod, petrale sole and dogfish, but not for sand sole or silvergray rockfish (Table 5). Forage fish showed up as a primary component in the stomachs of arrowtooth flounder, Pacific cod, sand sole and dogfish. Salmon (chum, pink and sockeye) was important to only petrale sole and lingcod. Predatory mesozooplankton was also important for sand sole and silvergray rockfish, and macrobenthos and euphausiids were important to several groups.

The crab feeders showed different preferences for specific macrobenthic species, with crabs of the genus *Cancer* such as the furrowed rock crab, *Cancer branneri*, the graceful rock crab, *C. gracilis* and the red rock crab, *C. productus* of greatest importance, together with gastropod and bivalve molluscs. Forage fish were also important to most of these species, with herring and various flatfish important to some (Table 6).

In the case of the annelid feeders polychaetes were the most important meiobenthic component in each case, but differences were apparent among the groundfish in terms of the species of benthic organisms taken (Table 7). Within this group, only Rock sole and English sole fed on forage fish to any extent.

In the case of the shrimp feeders, black skate focused primarily on *Crangon communis*, whereas speckled sanddab fed mainly on *Crangon alba* (Table 8). Walleye pollock and flathead sole both fed primarily on a commercial shrimp species, *Pandalus tridens*.

In the case of the euphausiid feeders, the species of euphausiids could not always be discerned (Table 9). However, the largest group of identified euphausiids in each case was *Thysanoessa spinifera*, except for eulachon and yellowtail rockfish, for which *Euphausia pacifica* was the most important identified species of euphausiid found within the stomachs.

#### EXAMINATION OF SEASONAL AND SPATIAL VARIANCE IN DIETS OF GROUND FISH

Only Pacific cod and dogfish stomachs were processed from Cruise 4, thus there was a second set of summer diet data for these two species only. The seasonal comparisons for all other fish species were among cruises 1-3 (ie 1 summer, 1 fall and 1 winter cruise each). Initially, we examined mean stomach weights by area and by cruise for adult fish of all species except for sablefish, which were all juveniles, and dogfish, for which both adults and juveniles were examined (Figs. 19 & 20). Pacific halibut and dogfish had the greatest weight of prey in stomachs. In general, weight of prey contents in stomachs were greater in the fall and winter than for the summer. No consistent patterns could be seen by area, however, although prey

content weights were highest overall in area D for both Pacific cod and dogfish, which were the two species sampled from all four areas. Of the benthivores, only big skate, black skate and Dover sole had higher stomach contents in the northern area (A and/or B) as compared with the southern areas (C and D).

## SEASONAL AND SPATIAL PATTERNS

### Data for this section is in Appendices 3-4.

**Benthic feeders:** The following benthivores showed spatially invariant diets: Dover sole, rex sole, flathead sole, big skate, black skate, longnose skate, ratfish and redbanded rockfish. In all cases, macro and meiobenthic organisms were important in the diet for all cruise/area combinations, although the specific types of organisms did change. For example, in the case of rex sole, during the first summer cruise focus was primarily on echinurans in area A and on annelids in area C, whereas during the fall, focus was on shrimp in area A, on annelids in area C, and on crabs and annelids in area D, and during the winter, focus was on bivalves and annelids in area A, on annelids in area C and on various crustacea in area D. However, some seasonal variability was apparent. For example, big skate fed on more fish in fall and winter diets than the summer diet, and focussed on other flatfish species in winter which did not show up in the other cruises. Seasonal differences were also seen for redbanded rockfish which did not feed on in the summer but fed on a high proportion of fish in the diet in the fall of 1985.

In the case of English sole adults and juveniles, although benthic organisms were important for each cruise, forage fish ranked first for both adults and juveniles in area A during the fall of 1985. Macrobenthos was also a primary component of the diet of rock sole, although forage fish were preferred in area B in the fall of 1985 and winter of 1986. Primary diet components for walleye pollock varied from cruise to cruise, with focus varying among commercial shrimp, euphausiids, mysids, non-commercial shrimp and various other macrobenthic organisms depending on the cruise and area. Speckled sanddab focussed primarily on euphausiids, but sandlance was of primary importance in area B during the winter cruise.

**Planktivores:** The following planktivores showed spatial invariance in diet: Pacific ocean perch adults and juveniles, greenstripe rockfish, yellowtail rockfish and Pacific sanddab. Sablefish focused on different items during each cruise, varying from fishes in the summer cruise in 1985, to annelids in area A and euphausiids in area C of the fall cruise in the same year.

**Piscivores:** These species showed more spatial variability: arrowtooth flounder showed a varied diet, concentrating mainly on fish, euphausiids and macrobenthos, with euphausiids particularly favoured in area A during the summer 1985 for both adults and juveniles. When diet for all areas was pooled, it was apparent that herring was the most important component in the summer, whereas unidentified fish were most important in the fall and winter. Overall, the proportion of fish in the diet was greatest overall in the fall.

Pacific cod diet also exhibited a variable diet, and primary components varied from area to area. The focus was particularly on macrobenthos, forage fish and shrimp, but different components differed in importance during the cruises, for example, unidentified fish in the summer cruises in



1985 and 1987, forage fish in the fall of 1985 and herring in the winter cruise of 1986. Again, the proportion of fish in the diet was higher in fall and winter than summer.

Pacific halibut concentrated mainly on macrobenthos (bivalves and/or crabs) and fish, but fed primarily on fish during the fall cruise in areas A and D, and in the winter cruise in areas C and D. Thus, again seasonal changes were apparent, with more fish taken in the winter and fall diets than summer diet (primarily herring in the winter).

Dogfish concentrated primarily on fish and euphausiids, although macrobenthos was dominated in area B over all years. This species also showed more fish in the winter diet than other seasons, and herring was main diet component in cruise 3 (winter) which was not seen in the other cruises.

Petrale sole also fed mainly on benthic organisms and shrimp except for in area C in winter, where herring and other fish were the primary components. Petrale sole also showed seasonal changes with more fish (primarily herring) in the winter diet than the summer and fall diets, and no fish at all in the summer diet.

In summary, the following 8 species appeared to have a relatively spatially invariant diet: Pacific cod, Dover sole, big skate, black skate, longnose skate, ratfish, rex sole, walleye pollock, English sole. The following 7 species were found in too limited a number of locations to be able to comment on the spatial variance: Pacific ocean perch, redbanded rockfish, silvergray rockfish, yellowtail rockfish, sablefish, Pacific sanddab, petrale sole (but differences did appear to exist), and flathead sole. Finally, the diet for the following 5 species did show spatial variance: rock sole, arrowtooth flounder, dogfish, Pacific halibut, and English sole.

Seasonal differences were apparent for Pacific halibut, dogfish, big skate, Pacific cod, petrale sole, rock sole, English sole, walleye pollock, arrowtooth flounder, silvergray rockfish, and sablefish. The following 6 species showed seasonally invariant diets: black skate, ratfish, yellowtail rockfish, rex sole, flathead sole, Dover sole and there were not enough comparisons for Pacific ocean perch and longnose skate to be able to determine seasonal patterns. Overall, more species showed seasonal variability than spatial variability. In addition, the benthic species showed less seasonal and spatial variance in diets as compared to the piscivores.

Spatial/seasonal diets are shown for two piscivores, arrowtooth flounder and dogfish (Figs. 21&22); as compared with a benthivore (ratfish) that shows very low spatial and seasonal variability in diet (Fig. 23).

#### **BREADTH OF DIET**

For those species that did display seasonal variation in the number of components taken in the diet, most (dogfish, big skate, redbanded rockfish, arrowtooth flounder, rex sole, flathead sole, Pacific halibut, rock sole, Dover sole) showed greatest number of components (pooled to the level in Table 2) in the diet in the fall of 1985 (Table 10). Thus overall, greatest diet breadth occurred for most fish species during the fall of 1985.

## DIET OF BENTHIVORES RELATIVE TO PREY AVAILABILITY

The benthic organisms found within the diets of the benthivores English sole, rex sole, and Dover sole were compared with the primary benthic organisms identified as most common within each spatial area (A-D) (Burd and Brinkhust 1987; Table 11). We chose these three species since they fed on both macrobenthic and meiobenthic components. The comparison is hindered by the fact that often polychaetes and other groups were not identified down to the species level due to the state of digestion of the organisms within the stomachs. However, using the top diet components as a guide, and focussing on the identified species, it is apparent that in no case were the benthivores apparently favouring the most abundant species of benthic organisms available. In addition, although there is some overlap of species taken by English sole, Dover sole and rex sole, in general, there were marked differences among the groups in terms of the favoured species.

## ECOPATH RESULTS

The trophic structure of the Hecate Strait food web as output from the balanced Ecopath model is shown in Figure 24. It is apparent that the Hecate Strait groundfish occupy more than one trophic level. For example, Pacific ocean perch is a planktivore (level 2-3), English sole feeds primarily on annelids (level 3-4), and Pacific cod and lingcod are piscivores (level 4). The top groundfish predators, as shown by trophic level, are Pacific cod, lingcod, dogfish, and other rockfish. In general, ontogenetic differences are clear, in that adult fish tend to occupy higher trophic levels than juveniles of the same species. The exception to this is for rock sole, where juveniles occupy a higher trophic level due to a high proportion of sandlance found within juvenile rock sole stomachs.

A further output from the model is the diagram of mixed trophic impacts (Fig. 25). We can use this to examine the relative impacts of any one group on other functional groups. The bars in this figure show relative, not absolute, impacts, but are comparable between groups (Christensen, et al., 2000). Bars pointing downwards indicate negative impacts, whereas positive impacts (beneficial predation) are shown by the bars pointing upwards. In this latter case, the negative direct impact on prey is reduced by indirect positive impacts. This may result when a predator feeds on another predator or competitor of the prey. As can be seen in the figure, phytoplankton, spring zooplankton, copepods, euphausiids, and predatory mesozooplankton all show positive impacts on a wide variety of species, since these items are the base of the food chain. Herring and forage fish also show positive impacts on a wide variety of species, due to their importance as prey items in the food chain.

Juvenile sablefish have a positive impact on ratfish and a negative impact on dogfish. The positive impact on ratfish is no doubt the result of the predation by sablefish on dogfish. This feeding on dogfish by sablefish benefits ratfish since dogfish are one of their main predators. Transient killer whales have positive impacts on benthivores and Pacific cod, probably because of the impact of feeding on their seal and sea lion predators.

Pacific cod shows negative effects on juvenile POP, Inshore rockfish, Dover sole, arrowtooth flounder, as well as on juvenile rock sole and English sole. These effects are likely due to

predation, except for the interactions with Dover, English and rock sole, which are probably competition, since these fish were not prey items of Pacific cod.

Dogfish show negative impacts on ratfish, juvenile rock sole and coho salmon, all the result of predation, and also show a positive impact on juvenile sablefish, for which they are a prey item.

Finally we used the output from the Ecopath software to examine niche overlap (Table 12, Fig. 26). The table shows all the predator and prey impacts, whereas the figure plots those species that show both a high predator *and* a high prey overlap (both over 40%). It is apparent that most groundfish species were more likely to overlap in their choice of prey items rather than in their shared predators.

Predator overlaps were particularly high (>50%) for juvenile sablefish and halibut, Dover sole and juvenile POP, juvenile rock sole and both Dover sole and juvenile POP, adult English sole and adult rock sole, adult and juvenile Pacific cod, juvenile English sole and juvenile rock sole, arrowtooth flounder and juvenile POP, arrowtooth flounder and Dover sole, arrowtooth flounder and juvenile English sole, adult Pacific cod and adult rock sole, adult Pacific cod and adult English sole, and herring and forage fish (Table 12).

Prey overlap was particularly high (>50%) for dogfish and juvenile rock sole, lingcod and arrowtooth flounder, juvenile and adult rock sole and arrowtooth flounder, juvenile Pacific cod and juvenile rock sole, adult and juvenile Pacific cod and lingcod, Dover sole and ratfish, lingcod and dogfish, adult rock sole and juvenile Pacific cod, adult rock sole and ratfish, adult rock sole and dogfish, halibut and Dover sole, skates and dogfish, adult and juvenile rock sole, and lingcod and adult rock sole (Table 12).

Several species shared both a high level of prey items and were predated on by similar organisms: both predator and prey overlap were particularly high (both >40%) for adult Pacific cod and adult rock sole, juvenile rock sole and arrowtooth flounder, juvenile English sole and Dover sole, adult English sole and adult rock sole, and adult and juvenile Pacific cod, and juvenile Pacific cod and adult rock sole (Fig. 26).

## Discussion

In summary, our examination of stomach content data for 30 species of groundfish caught between 1985-1987 in Hecate Strait, resulted in the identification of five major feeding strategies: piscivores, planktivores (euphausiid feeders), shrimp feeders, macrobenthivores and benthivores (macro- and meiobenthic feeders). Of these groups, it was apparent that the greatest diet breadth was exhibited by the piscivores, particularly dogfish, Pacific cod and Pacific halibut, whereas the lowest diet breadth was exhibited by benthivores such as black skate, longnose skate, Dover sole and English sole, and the planktivore, Pacific ocean perch. Flatfish were split evenly among the benthivore and piscivore classes, with Pacific halibut, petrale sole, rock sole, butter sole, lingcod, sand sole and arrowtooth flounder showing greatest reliance on various fish species, and speckled sanddab, rex sole, flathead sole, English sole and Dover sole showing greatest reliance on benthic organisms. Pacific sanddab also fed on benthic prey, but was classified as a planktivore due to the high proportion of euphausiids found in its diet. With the

exception of spiny dogfish, all the elasmobranchs studied (big skate, black skate, longnose skate and ratfish) were classified as benthivores.

Ontogenetic variability in diet was most apparent for the piscivores: juveniles fed on macrobenthic groupings to a greater extent than the adults, which showed greater reliance on fish. The benthivore Dover sole did not appear to show strong ontogenetic changes in diets. Juvenile Pacific ocean perch relied on copepods and benthic organisms to a greater extent than the adults, which fed almost solely on euphausiids, but both adults and juveniles fed on euphausiids. Interestingly, two benthivores, rock sole and English sole, showed particularly high proportions of forage fish in the juvenile diets. Conversely, Lang et al. (1995) found that juvenile rock sole fed on more gammarids and fewer polychaetes and fish than adults. However, the authors also suggested that large, soft-bodied, high calorific prey such as fish may be digested much more slowly and remain in the stomach longer than smaller prey with exoskeletons, such as amphipods (Huebner and Langton 1982). Ontogenetic shifts in diet of fish have been documented by many authors (e.g. Schmitt and Holbrook 1984; Ross 1978; Grossman 1980). We would expect higher levels of fish prey in the diet of older fish, which will have higher mobility, and larger mouth gape, and this was found to be the case for most of the piscivores studied.

Seasonal/spatial comparisons of diet were made for most species and seasonal variation in diets was generally more common than spatial variation during a season. Most species showing seasonal variation in diet displayed a higher proportion of fish in their diets in the fall or winter over their summer diets. In addition, the number of components in the diet was higher in the fall of 1985 than the summer of 1985 and winter of 1986 for the majority of species.

Benthivores tended to show least spatial and temporal variability in diets as compared with piscivores. Other studies have found similar differences in diet constancy among these groups (e.g. Link et al. 2002). In their study of flatfish in the Northwest Atlantic, benthivores showed constancy in diet choice over a 20 year time series, whereas some of the piscivores showed significant changes in diet composition over the time series. We might question whether specialized benthic and plankton feeders in Hecate Strait might be at a disadvantage in the long term. However, time series of abundance of the fish species in this study from surveys done in Hecate Strait since 1984 show similar levels of temporal variability for both grazers and piscivores (Alan Sinclair DFO, pers. comm.). Such variations might be related to natural fluctuations in abundance of polychaetes, bivalves, crabs, echinoderms and echinurans, which were the most important groups taken by benthivores. Only one short-term detailed study of benthic fauna has taken place in Hecate Strait (Burd and Brinkhurst 1987), but no long term studies have been carried out in this region.

Burd and Brinkhurst (1987) examined the macrobenthic fauna during the same cruises from which stomach samples were collected and concluded that depth and geographic proximity were the most important environmental factors studied that affected benthic fauna. Polychaetes, gastropods, and echinoderms were found most commonly in the stomachs of the benthivores, which were three of the dominant groups of benthos found in Hecate Strait. However, the differences in benthic biomass among cruises (lowest during the first summer 1985 cruise) and areas (higher in areas A and B than C and D) were not generally reflected in stomach content weights or breadth of diet for the species studied. Three benthivores, English sole, Dover sole



and rex sole, did show spatial differences both within and among the species in their diets. The choices of benthic organisms did not match the benthic species identified by Burd and Brinkhurst (1987) as being most common in each spatial area. Thus, the benthivores likely have distinct preferences that may possibly reduce the dietary overlap among species that are feeding on similar groups e.g. polychaetes, bivalves, crustaceans and echinoderms.

The bottom features and depths of the four sampling areas A, B, C and D in Hecate Strait were well described by Burd and Brinkhurst (1987). These differences will affect both the fish species present as well as the types of benthos and other prey items available. Fargo and Tyler (1991) found four relatively stable fish assemblages in Hecate Strait, which were dominated by flatfish species and characterized by depth and bottom type. They found persistent boundaries in the 50-60 m range and the 130-140 m range. The Butterworth assemblage (Area A) appeared to be dominated by arrowtooth flounder, Dover sole, rex sole and ratfish, the Moresby Gully assemblage (Area C) by Pacific ocean perch and other rockfish species, the Bonilla (Area D) assemblage by Pacific cod, English sole and Dogfish, and the Reef Island (Area B) assemblage by dogfish, skate, halibut and Rock sole. These authors noted that Dover sole, which prefer feeding on organisms in mud sediments, appeared to be important in the Butterworth assemblage but not in the Bonilla assemblage. The Reef Island assemblage appeared to contain fewer flatfish species as dominants than the Butterworth or Bonilla assemblages. They suggested that this may be because less of the preferred substrate, sand and mud, exists in this location. In contrast, they noted that two piscivores, rock sole and halibut, were apparently dominant in this area.

We may assess the possible competitive and predator-prey interactions by examining the spatio-temporal overlap, (assessed from catches in the B.C. trawl fishery), of species showing similar diet choices. Most species move into deeper water in the winter except for English sole, rock sole, Pacific cod, skates, flathead sole and ratfish which remain at similar depths all year. Many species are caught in much lower numbers in the winter, including lingcod, flathead sole, rex sole, sablefish, arrowtooth flounder, petrale sole and Dover sole. Some of these species, for example petrale sole, arrowtooth flounder and Dover sole tend to show a much wider spread of depth distributions in the winter than the summer, which may be the result of competition for food or predation effects. Some species show similar spatial and depth distributions all year, such as English sole, ratfish, skates and Pacific ocean perch.

In summer in the Butterworth Assemblage (Area A), the most abundant species area are arrowtooth flounder, Dover sole, English sole, rex sole and ratfish (Fargo and Tyler 1991). In the winter, Dover sole are absent and arrowtooth flounder and dogfish are less abundant. Of these species, it would appear that competition may occur between Dover sole, Rex sole and English sole and also between dogfish and Pacific cod based on our cluster analyses. However, we need to focus also on depth preferences of these species as it is possible that they could coexist, but be in very different parts of the water column. Dogfish move from shallow depths in summer to deeper depths in winter. They appear to be found at a mean depth of 150 m in the summer and 250 m in the winter, and are most common in this area during August to November. Pacific cod remains at a mean depth of around 120 m year round and are found within this area year round. These species are unlikely to interact greatly during the winter months but could impact one another during the summer months, particularly August - November.

English sole appears to remain at a mean depth of 100 m and within this area year round. Dover sole move very deep (4-500 m) in the winter, and are mostly absent from this area during December to April, but are found at a mean depth of about 150m and within this area in the summer (highest abundance is in June). Rex sole moves from a summer mean of 120 m to a winter mean depth of around 250 m and are most abundant within this area during May-December. All three species may impact one another during summer months.

Ratfish remain at shallow depths (mean of 120 m) all year. None of the species within the ratfish feeding cluster are abundant in this area. However, ratfish appeared to feed primarily on macrobenthos, which is also targeted by Dover sole, rex sole, and English sole so competitive effects are possible between ratfish and English sole year round, and between ratfish and both rex sole and Dover sole during the summer.

In the Reef Island Assemblage (Area B), we expect competition between halibut and big skate based on their diets. Halibut moves from a summer mean depth of 100 m to a winter mean of about 250-300 m. Skates tend to remain at a mean depth of 100 m year round. These two species would interact and could compete over the summer months. Dogfish apparently moves out of the area completely, but some halibut remain (Fargo and Tyler 1991). The seasonal diet variation for Pacific halibut, rock sole and big skate was examined to try to determine whether the movement of dogfish out of the environment has any impact on these other species. However, breadth of diet did not appear to increase for any of these species over the winter period.

In the Bonilla Assemblage (Area D), the summer assemblage is made up of Pacific sanddab, halibut, rex sole, English sole and dogfish (Fargo and Tyler 1991). The winter assemblage is made up of the same species but dogfish are rare. Of the above species we may expect competition between rex sole and English sole. These species are both found in this area year round, but rex sole moves to greater depths than English sole during the winter. Thus, these species may compete during the summer months.

In summary, in the deep and cool Butterworth Assemblage, it would appear that dogfish and Pacific cod are unlikely to interact greatly during the winter months but could impact one another during the summer months. English sole, Dover sole and Rex sole may impact one another during summer months. Competitive effects were also likely between ratfish and English sole year round, and between ratfish and both Rex sole and Dover sole during the summer.

In the shallow and warm Reef Island Assemblage the spatial and diet overlap suggested that competition could occur between halibut and big skate. Based on depth preferences, these two species would interact and could compete over the summer months. Finally, in the intermediate depth Bonilla Assemblage competition could occur between Pacific cod, arrowtooth flounder and dogfish, and also between Rex sole and English sole during the summer.

Burd and Brinkhurst (1987) examined the macrobenthic fauna from grab samples during the same cruises from which stomach samples were collected. They noted that the four areas (A,B,C and D) were statistically distinct in terms of species abundance of benthic organisms and that total wet weights (and possibly productivity) of benthos were much higher in the two northerly



Areas A and B than in southerly Areas C and D with lowest biomasses collected overall during the first cruise (June 1985) than in all the others. The infaunal biomass was dominated by Nemertea, Polychaeta, Gastropoda, Pelecypoda, Ophiuroidea and Echinoidea. We compare specific benthivore diets with the predominant species recorded in each area in the results section. It was apparent, using the top diet components as a guide, and focussing on the identified species, that in no case were the benthivores apparently favouring the most abundant species of benthic organisms available. In addition, although there was some overlap of species taken by English sole, Dover sole and rex sole, there were generally marked differences among the groups in terms of the favoured species.

Overall, the benthivores tend to show the least variable seasonal depth distributions, and were generally spatially sedentary. In contrast, piscivores such as petrale sole, dogfish, and arrowtooth flounder, tend to show large migrations to depth in the winter, while dogfish, arrowtooth flounder and Pacific cod also show very variable spatial distributions over the year. Like the benthivores, shrimp and euphausiid feeders tend to show more habitat fidelity, and only Walleye Pollock and sablefish display migrations to depth in the winter.

Dogfish, Dover sole, arrowtooth flounder and bocaccio show seasonal bathymetric migrations to deeper water during the winter. The transient habit of arrowtooth flounder and dogfish may be critical to community structure within the different spatial regions within Hecate Strait, since these two species have the highest biomass in Hecate Strait (Fargo and Tyler 1991). Time series of abundance for these two species for 1984-2000 survey data show that arrowtooth flounder has apparently increased since 1993, whereas trends for dogfish are fairly stable between 1984-2000. The diet breakdown suggests that dogfish could impact the abundance of herring, salmon, rock sole, and English sole in Hecate Strait. Arrowtooth flounder could impact herring and walleye pollock and inshore rockfish based on diet composition and could compete with dogfish, Pacific cod, petrale sole and halibut for herring.

Future work will incorporate more recent habitat and sediment assessments of the different areas of the Strait, and use this information to further examine the specific species preferences of the different species examined during this study with respect to habitat. However, as many authors have noted, degree of diet overlap and similarity will depend on the level of prey identification (e.g. Zhang 1988). More detailed future studies of the benthic infaunal species composition, abundance and spatial distribution, together with long-term studies of groundfish diets, would allow us to examine the relative fluctuations in abundance of benthic fauna and forage fish, temporal changes in fish diets, the effects of pulses in abundance of predators such as Pacific cod on the food web, as well as to discern the critical environmental factors shaping the species assemblages within Hecate Strait.

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## References

- Burd, B.J., and Brinkhurst, R.O. 1987. Macrobenthic Infauna from Hecate Strait, British Columbia. Can. Tech. Rep. Hydr. Ocean Sci. No. 88.
- Christensen, V., and Pauly, D. 1992a. Ecopath II- An Approach and software for construction of ecopath models and food web analysis.
- Christensen, V., and Pauly, D. 1992b. A guide to the ECOPATH II program (version 2.1). ICLARM Software 6, 72p. International Center for Living Aquatic Resources Management, Manila, Philippines.
- Christensen, V., C.J. Walters, and Pauly, D. 2000. Ecopath with Ecosim Version 4, Help system©.
- Fargo, J., Foucher, R.P., Saunders, M.W., Tyler, A.V., and Summers, P.L. 1988. F/V EASTWARD HO assemblage survey of Hecate Strait, May 27-June 16, 1987. Can. Data Rep. Fish. Aquat. Sci. 699.
- Fargo, J., Tyler, A.V., and Foucher, R.P. 1990. Distribution of demersal fishes in Hecate Strait, British Columbia, based on systematic trawl surveys carried out from 1984-1987. Can. Tech. Rep. Fish. Aquat. Sci. 115.
- Fargo, J. and Tyler, A.V. 1991. Sustainability of flatfish-dominated fish assemblages in Hecate Strait, British Columbia, Canada. Neth. J. Sea Res. 27 (3/4): 237-253.
- Grossman, G.D. 1980. Ecological aspects of ontogenetic shifts in prey size utilization in the Bay Goby (Pisces: Gobiidae). Oecologia 47: 233-238.
- Foucher, R.P., A.V. Tyler, M.W. Saunders, and Janusson, D.H. 1988. FRV GB REED Assemblage Survey of Hecate Strait, January 27-February 18, 1986 Can. Data Rep. no. 708.
- Huebner, J.D., and Langton, R.W. 1982. Rate of gastric evacuation for winter flounder, *Pseudopleuronectes americanus*. Can. J. Fish. Aquat. Sci. 39: 356-360.
- Lang, G.M., P. A. Livingston, and Miller, B.S. 1995. Food habits of Three Congeneric Flatfishes: Yellowfin Sole (*Pleuronectes asper*), Rock Sole (*P. bilineatus*), and Alaska Plaice (*P. quadrituberculatus*) in the Eastern Bering Sea. In "Proceedings of the International Symposium on North Pacific Flatfish. Alaska Sea Grant College Program Report No. 95-04. University of Alaska Fairbanks. pp. 225-245.
- Link, J.S., K. Bolles, and Milliken, C.G. 2002. The feeding ecology of flatfish in the Northwest Atlantic. J. NW Fish. Sci. 30: 1-18.
- Perry, R.I., M. Stocker, and Fargo, J. 1994. Environmental Effects on the Distribution of Groundfish in Hecate Strait, British Columbia. Can. J. Fish. Aquat. Sci. 51:1401-1409.
- Pianka, E.R. 1973. The structure of lizard communities. Ann. Rev. Ecol. Syst. 4: 53-74.

- Polovina, J.J. 1984. An overview of the ECOPATH model. *Fishbyte* 2: 5-7.
- Ross, S.T. 1978. Trophic ontogeny of the leopard searobin *Prionotus scitulus* (Pisces: Triglidae). *Fish. Bull., U.S.* **76**(1): 225-234.
- Saunders, M.W., R.P. Foucher, A.V. Tyler, and Moore, D.F. 1986. Groundfish food resource division sub-project of the Hecate Strait project R.V G.B. REED cruises in Hecate Strait, BC, during June 7-17, and September 23-October 4, 1985. *Can. Data Rep. no.* **602**.
- Schmitt, R.J., and Holbrook, S.J. 1984. Ontogeny of prey selection by black surf-perch *Embiotoca jacksoni* (Pisces: Embiotocidae): the roles of morphology, foraging behaviour, and patch selection. *Mar. Ecol. Prog. Ser.* **18**: 225-239.
- Tyler, A.V. 1986. Hecate Strait Project : results of the first two years of multispecies fisheries research. *Can. Tech. Rep. Fish. Aquat. Sci.* **1470**.
- Tyler, A.V.; Richards, L.J., and Walters, C.J. 1986. Hecate Strait Project : report on the Hecate Strait ecosystem modelling workshop. *Can. Man. Rep. Fish. Aquat. Sci.* **1879**.
- Tyler, A.V. 1989. Hecate Strait Project : results from four years of multispecies fisheries research. *Can. Tech. Rep. Fish. Aquat. Sci.* **1675**.
- Walters, C. , Pauly, D., Christensen, V., and Kitchell, J.F. 2000. Representing the density dependent consequences of life history strategies in aquatic ecosystems: Ecosim II. *Ecosystems* **3**: 70-83.
- Zhang, C.I. 1988. Food habits and ecological interactions of Alaska plaice, *Pleuronectes quadrituberculatus*, with other flatfish species in the eastern Bering Sea. *Bull. Korean Fish. Soc.* **21**(3): 150-160.

**Table 1.** Number of predator stomachs sampled from the four different stomach sampling stations, A,B,C and D, between 1985-1987, for all four cruises pooled.

| Predator Species                                            | A    | B    | C    | D   | Totals<br>* | No. fish<br>with<br>empty<br>stomachs |
|-------------------------------------------------------------|------|------|------|-----|-------------|---------------------------------------|
| Arrowtooth Flounder (Turbot) ( <i>Atheresthes stomias</i> ) | 503  |      | 415  | 59  | 977         | 67                                    |
| Big Skate ( <i>Raja binoculata</i> )                        | 7    | 110  | 1    | 16  | 134         |                                       |
| Black Skate ( <i>Raja kincaidii</i> )                       | 27   |      | 6    |     | 33          |                                       |
| Butter sole ( <i>Iopsetta isolepsis</i> )                   |      | 4    |      | 2   | 6           | 1                                     |
| Curlfin sole ( <i>Plueronichthys decurens</i> )             |      |      |      | 1   | 1           |                                       |
| Dover sole ( <i>Microstomas pacificus</i> )                 | 89   |      | 207  | 9   | 305         | 5                                     |
| English sole ( <i>Parophrys vetulus</i> )                   | 73   | 81   | 79   | 200 | 433         | 13                                    |
| Eulachon ( <i>Thaleichthys pacificus</i> )                  | 10   |      |      | 10  | 20          | 3                                     |
| Flathead sole ( <i>Hippoglossoides elassodon</i> )          |      |      | 100  |     | 100         | 3                                     |
| Lingcod ( <i>Ophiodon elongatus</i> )                       | 7    |      | 16   | 7   | 30          | 5                                     |
| Longnose skate ( <i>Raja rhina</i> )                        | 2    | 20   | 8    |     | 30          |                                       |
| Pacific cod ( <i>Gadus macrocephalus</i> )                  | 188  | 96   | 187  | 102 | 573         | 16                                    |
| Pacific Halibut ( <i>Hippoglossus stenolepsis</i> )         | 95   | 41   | 11   | 8   | 155         | 3                                     |
| Pacific sanddab ( <i>Citharichthys sordidus</i> )           | 1    |      |      | 95  | 96          | 2                                     |
| Petrable sole ( <i>Eopsetta jordani</i> )                   | 2    |      | 46   | 58  | 106         | 2                                     |
| Ratfish ( <i>Hydrolagus collieri</i> )                      | 299  |      | 257  | 16  | 572         | 30                                    |
| Rex sole ( <i>Errex zachirus</i> )                          | 190  |      | 331  | 62  | 583         | 13                                    |
| Rock sole ( <i>Lepidosetta bilineata</i> )                  | 2    | 310  |      | 39  | 351         | 1                                     |
| Sablefish ( <i>Anoplopoma fimbria</i> )                     | 46   |      | 130  |     | 176         | 3                                     |
| Sand sole ( <i>Psettichthys melanostrictus</i> )            |      | 201  |      |     | 201         | 2                                     |
| Pacific ocean perch ( <i>Sebastes alutus</i> )              | 5    |      | 119  |     | 124         | 6                                     |
| Redbanded Rockfish ( <i>Sebastes babcocki</i> )             | 1    |      | 46   |     | 47          |                                       |
| Silvergray Rockfish ( <i>Sebastes brevispinis</i> )         | 5    |      | 34   |     | 39          |                                       |
| Greenstripe Rockfish ( <i>Sebastes elongatus</i> )          |      |      | 4    |     | 4           |                                       |
| Yellowtail Rockfish ( <i>Sebastes flavidus</i> )            | 30   |      | 30   |     | 60          | 2                                     |
| Bocaccio Rockfish ( <i>Sebastes paucispinis</i> )           | 2    |      | 6    |     | 8           |                                       |
| Speckled Sanddab ( <i>Citharichthys stigmaeus</i> )         |      | 89   |      |     | 89          |                                       |
| Spiny Dogfish ( <i>Squalus acanthias</i> )                  | 119  | 470  | 249  | 6   | 844         | 45                                    |
| Starry Flounder ( <i>Platichthys stellatus</i> )            |      |      | 3    |     | 3           |                                       |
| Walleye Pollock ( <i>Theragra chalcogramma</i> )            | 25   | 1    | 142  | 54  | 222         | 4                                     |
| Totals                                                      | 1728 | 1423 | 2427 | 744 | 6322        | 226                                   |

\* Includes the fish with empty stomachs

**Table 2:** Diet Groupings derived from the stomach data of the groundfish species collected 1985-1987.

| Group Name                                       |                                                       |
|--------------------------------------------------|-------------------------------------------------------|
| Chinook ( <i>Onchorhynchus tshawytscha</i> )     | Macrobenthos                                          |
| Coho ( <i>Onchorhynchus kisutch</i> )            | Meiobenthos                                           |
| Commercial Shrimp                                | Other Flatfish                                        |
| Copepods                                         | Pacific Cod, Adult ( <i>Gadus macrocephalus</i> )     |
| Detritus                                         | Pacific Cod, Juvenile                                 |
| Dogfish ( <i>Squalus acanthias</i> )             | Pacific ocean perch, Adult ( <i>Sebastes alutus</i> ) |
| Dover sole ( <i>Microstomus pacificus</i> )      | Pacific ocean perch, Juvenile                         |
| Dungeness Crab ( <i>Cancer magister</i> )        | Phytoplankton                                         |
| English Sole, Adult ( <i>Parophrys vetulus</i> ) | Predatory invertebrates                               |
| English Sole, Juvenile                           | Predatory mesozooplankton                             |
| Epibenthos                                       | Ratfish ( <i>Hydrolagus colliei</i> )                 |
| Euphausiids                                      | Rock Sole, Adult ( <i>Lepidosetta bilineata</i> )     |
| Forage Fish                                      | Rock Sole, Juvenile                                   |
| Halibut ( <i>Hippoglossus stenolepis</i> )       | Sablefish, Juvenile ( <i>Anoplopoma fimbria</i> )     |
| Herring, Adult                                   | Shallow water benthic fish                            |
| Herring, Juvenile                                | Squid                                                 |
| Inshore rockfish                                 | Transient Salmon                                      |
| Jellies/Macrozooplankton                         | Arrowtooth flounder ( <i>Atheresthes stomias</i> )    |
| Lingcod ( <i>Ophiodon elongatus</i> )            |                                                       |



**Table 3.** Main diet components (all data pooled), spatial distribution (regular or irregular) and depth distribution of the groundfish species collected 1985-1987.

| FEEDING GROUP        | PRIMARY DIET COMPONENTS                                                  | SPATIAL DISTRIBUTION | DEPTH DISTRIBUTION                              |
|----------------------|--------------------------------------------------------------------------|----------------------|-------------------------------------------------|
| <b>Grazers</b>       |                                                                          |                      |                                                 |
| <b>Rockfish</b>      |                                                                          |                      |                                                 |
| Redbanded rockfish   | Macrobenthos (40%), commercial shrimp (22%) and unidentified fish (17%). | Regular              | Regular                                         |
| <b>Gadoids</b>       |                                                                          |                      |                                                 |
| Walleye Pollock      | Commercial shrimp (62%), epibenthos (13%), euphausiids (11%)             | Irregular            | Irregular:<br>Deeper in winter                  |
| <b>Elasmobranchs</b> |                                                                          |                      |                                                 |
| Big skate            | Macrobenthos (63%), forage fish (17%), unidentified fish (9%)            | Regular              | Regular                                         |
| Black skate          | Epibenthos (42%), macrobenthos (40%), meiobenthos (11%).                 | Regular              | Regular                                         |
| Longnose skate       | macrobenthos (72%), other flatfish (11%), forage fish (8%).              | Regular              | Regular                                         |
| Ratfish              | Macrobenthos (81%), meibenthos (8%)                                      | Regular              | Regular<br>97m (May)-<br>136m (Feb)             |
| <b>Flatfish</b>      |                                                                          |                      |                                                 |
| Speckled sanddab     | Epibenthos (60%), macrobenthos (16%), forage fish (14%)                  | Regular              | Regular                                         |
| Rex sole             | Macrobenthos (41%), meiobenthos (35%), epibenthos (21%)                  | Regular              | Deeper in winter<br>150m (Sept)-<br>193m (Feb)  |
| Flathead sole        | Commercial shrimp (62%), epibenthos (25%), macrobenthos (11%)            | Regular              | Regular<br>113m (April)-<br>146m (Oct)          |
| English sole         | Meiobenthos (62%), macrobenthos (27%), forage fish (8%)                  | Regular              | Regular<br>90m (May)-<br>113m (Dec)             |
| Dover sole           | Meiobenthos (54%), macrobenthos (43%)                                    | Irregular            | Deeper in winter<br>163m (Sept)-334m<br>(March) |

|                          |                                                                                                                |           |                                                               |
|--------------------------|----------------------------------------------------------------------------------------------------------------|-----------|---------------------------------------------------------------|
| <b><u>Piscivores</u></b> |                                                                                                                |           |                                                               |
| <b>Rockfish</b>          |                                                                                                                |           |                                                               |
| Silvergray rockfish      | Unidentified fish (64%), euphausiids (28%), Walleye pollock (9%)                                               | Regular   | Deeper in winter                                              |
| Bocaccio                 | Walleye pollock (85%), unidentified fish (13%)                                                                 | Regular   | Deeper in winter                                              |
| <b>Gadoids</b>           |                                                                                                                |           |                                                               |
| Pacific cod              | Forage fish (31%), unidentified fish (17%), other flatfish (16%), herring (9%)                                 | Regular   | Regular<br>99m (Jul)-<br>138m (Dec)                           |
| <b>Elasmobranchs</b>     |                                                                                                                |           |                                                               |
| Dogfish                  | Unidentified fish (34%), macrobenthos, (18%), herring (16%), forage fish (12%)                                 | Irregular | Deeper in winter<br>80m (Aug)-<br>211m (Feb)                  |
| <b>Flatfish</b>          |                                                                                                                |           |                                                               |
| Pacific halibut          | Macrobenthos (44%), unidentified fish (10%), forage fish (10%), arrowtooth flounder (10%), other flatfish (8%) | Irregular | Irregular:<br>Deeper in winter<br>100m (Jul)-<br>257m (Jan)   |
| Petrale sole             | Herring (49%), unidentified fish (21%), epibenthos (20%)                                                       | Irregular | Irregular:<br>Deeper in winter<br>108m (Jul)-<br>302m (March) |
| Rock sole                | Forage fish (41%), meiobenthos (26%), macrobenthos (25%)                                                       | Regular   | Regular<br>56m (May)-<br>70m (Sept)                           |
| Butter sole              | Forage fish (84%), meiobenthos (11%)                                                                           | Regular   | Regular                                                       |
| Lingcod                  | Unidentified fish (65%), herring (10%), English sole (9%)                                                      | Irregular | Irregular:<br>Deeper in winter<br>105m (July)-<br>172m (Feb)  |
| Arrowtooth flounder      | Unidentified fish (51%), herring (13%), macrobenthos (12%), forage fish (10%)                                  | Irregular | Deeper in winter<br>133m (Aug)-<br>305m (Jan)                 |
| Sand sole                | Forage fish (36%), unidentified fish (26%), shallow water benthic fish (15%), other flatfish (10%)             | Regular   | Regular                                                       |

|                      |                                                                      |           |                                                             |
|----------------------|----------------------------------------------------------------------|-----------|-------------------------------------------------------------|
| <b>Planktivores</b>  |                                                                      |           |                                                             |
| <b>Forage fish</b>   |                                                                      |           |                                                             |
| Eulachon             | Euphausiids (57%),<br>macrobenthos (43%)                             | Regular   | Regular                                                     |
| <b>Rockfish</b>      |                                                                      |           |                                                             |
| Pacific ocean perch  | Euphausiids (90%),<br>macrobenthos (7%)                              | Regular   | Irregular<br>223m (Aug)-<br>293m (Jan)                      |
| Greenstripe rockfish | Euphausiids (82%),<br>macrobenthos (12%)                             |           | Irregular                                                   |
| Yellowtail rockfish  | Euphausiids (58%),<br>commercial shrimp (21%),<br>macrobenthos (14%) | Irregular | Regular                                                     |
| Sablefish            | Euphausiids (58%),<br>unidentified fish (16%),<br>macrobenthos (11%) | Irregular | Irregular:<br>Deeper in winter<br>168m (Jan)-<br>288m (Jun) |
| <b>Flatfish</b>      |                                                                      |           |                                                             |
| Pacific sanddab      | Euphausiids (49%),<br>epibenthos (42%),<br>macrobenthos (11%)        | Regular   | Regular                                                     |

**Table 4.** Percentage by weight of prey fish species in the stomachs of the piscivores collected between 1985-1987.

| Diet item/<br>Predator<br>species | Dogfish | Pacific<br>cod<br>(adult) | Pacific<br>cod (juv) | Arrowtooth<br>flounder<br>(adult) | Arrowtooth<br>flounder<br>(juv) | Halibut | Petrale<br>sole | Rock sole<br>(juv) | Sand sole | Silvergray<br>Rockfish | Lingcod |
|-----------------------------------|---------|---------------------------|----------------------|-----------------------------------|---------------------------------|---------|-----------------|--------------------|-----------|------------------------|---------|
| Unidfish                          | 33.9    | 16.9                      | 16.5                 | 52.5                              | 37.8                            | 10.1    | 21.1            | 1.3                | 26.1      | 63.52                  | 64.56   |
| Forage fish                       | 11.9    | 31.9                      | 27.4                 | 10.8                              | 4.6                             | 10.06   |                 | 74.14              | 36.04     |                        |         |
| Other<br>flatfish                 | 2.6     | 18.04                     | 0.05                 | 0.3                               |                                 | 7.5     | 0.02            |                    | 9.6       |                        | 7.21    |
| SWB*                              | 0.8     | 1.5                       | 2.5                  | 2.2                               | 3.3                             | 4.1     | 1.4             | 0.03               | 15.0      | 0.16                   | 7.73    |
| Arrow-<br>tooth<br>flounder       |         | 0.9                       |                      |                                   |                                 | 9.8     |                 |                    |           |                        |         |
| Herring                           | 16.3    | 9.3                       | 9.8                  | 14.2                              | 4.2                             | 7.3     | 48.8            |                    |           |                        | 10.3    |
| Salmon                            | 1.6     |                           |                      |                                   |                                 | 1.8     | 0.6             |                    |           |                        | 1.61    |
| Pacific cod                       |         | 0.4                       |                      |                                   |                                 | 1.0     |                 |                    |           |                        |         |
| Inshore<br>rockfish               |         | 0.08                      | 2.2                  | 1.7                               |                                 |         |                 |                    |           |                        |         |
| Pollock                           |         | 6.1                       |                      | 0.07                              |                                 | 0.09    | 1.02            |                    |           | 8.63                   |         |
| Dover sole                        |         |                           |                      |                                   |                                 | 0.1     |                 |                    |           |                        |         |
| Ratfish                           | 1.6     |                           |                      |                                   |                                 |         |                 |                    |           |                        |         |
| Dogfish                           |         |                           |                      |                                   |                                 |         |                 |                    |           |                        |         |
| Rock sole                         | 0.04    |                           |                      |                                   |                                 |         |                 |                    | 3.8       |                        |         |
| Pacific<br>ocean perch            |         | 0.7                       |                      |                                   |                                 |         |                 |                    |           |                        |         |
| English sole                      | 0.2     |                           |                      |                                   |                                 |         |                 |                    |           |                        | 8.51    |
| Total propn<br>of<br>fish in diet | 68.94   | 85.82                     | 58.45                | 81.77                             | 49.9                            | 51.85   | 72.94           | 75.47              | 90.54     | 72.31                  | 99.91   |

\*SWB= Shallow water benthic fish

**Table 5.** Top ten species (by weight) in stomachs of the piscivores. Weight is expressed as a proportion of all diet items for all hauls pooled.

| ARROWTOOTH FLOUNDER                                         | LINGCOD                                             | PACIFIC COD                                                  | PETRALE SOLE                                         | SAND SOLE                                                                            | SEBASTES BREVISPINIS                                         | DOGFISH                                                |
|-------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------|
| 44.9 % other fish<br>OSTEICHTHYES*                          | 14.3% other fish<br>OSTEICHTHYES                    | 30.2% forage fish<br>AMMODYTES<br>HEXAPTERUS                 | 47.2% herring<br>HERRING, PACIFIC                    | 36.0% predatory<br>mesozooplankton<br>LYSIANASSIDAE                                  | 42.7% other fish<br>UNID. FISH                               | 20.9% other fish<br>OSTEICHTHYES                       |
| 12.7% herring<br>HERRING, PACIFIC                           | 10.3% herring<br>HERRING, PACIFIC                   | 14.9% other flatfish<br>ACANTHOPTERYGII<br>PLEURONECTIFORMES | 21.1% other fish<br>OSTEICHTHYES                     | 16.7% forage fish<br>AMMODYTES<br>HEXAPTERUS                                         | 20.8% other fish<br>OSTEICHTHYES                             | 17.3% Herring<br>HERRING,<br>PACIFIC                   |
| 9.8% forage fish<br>AMMODYTES<br>HEXAPTERUS                 | 8.5% english sole<br>SOLE, ENGLISH                  | 9.6% other fish<br>UNID. FISH                                | 16.7% epibenthos<br>MYSIDACEA                        | 9.5% other fish<br>UNID. FISH                                                        | 17.5% euphausiids<br>THYSANOESSA<br>SPINIFERA                | 12.0% forage fish<br>AMMODYTES<br>HEXAPTERUS           |
| 7.4% macrobenthos<br>MALACOSTRACA<br>EUMALACOSTRACA         | 7.7% shallowwater<br>benthic fish<br>SCULPIN, GREAT | 9.3% herring<br>HERRING, PACIFIC                             | 2.9% euphausiids<br>EUCARIDA<br>EUPHAUSIACEA         | 8.8% other fish<br>OSTEICHTHYES                                                      | 10.0% euphausiids<br>EUCARIDA<br>EUPHAUSIACEA                | 10.6% other fish<br>UNID. FISH                         |
| 5.6% euphausiids<br>THYSANOESSA<br>SPINIFERA                | 7.2% other flatfish<br>LIMANDA ASPERA               | 7.2% other fish<br>OSTEICHTHYES                              | 2.7% epibenthos<br>NEOMYSIS<br>KADIAKENSIS           | 5.9% shallowwater<br>benthic fish<br>ACANTHOPTERYGII<br>SCORPAENIFORMES<br>COTTOIDEI | 8.6% walleye pollock<br>POLLOCK, WALLEYE                     | 8.9% Euphausiids<br>THYSANOESSA<br>SPINIFERA           |
| 5.6% other fish<br>UNID. FISH                               | 1.6% salmon<br>SALMON, SOCKEYE                      | 5.3% walleye pollock<br>POLLOCK, WALLEYE                     | 1.6% herring<br>CLUPEIDAE                            | 5.4% shallowwater<br>benthic fish<br>COTTIDAE                                        | 0.2% macrobenthos<br>ARTHROPODA<br>MANDIBULATA<br>CRUSTACEA  | 3.5% predatory<br>invertebrates<br>OCTOPUS<br>DOFLEINI |
| 2.3% macrobenthos<br>EUCARIDA<br>DECAPODA<br>NATANTS        | 0.3% other fish<br>UNID. FISH                       | 3.5% epibenthos<br>CRANGON ALBA                              | 1.0% walleye pollock<br>POLLOCK, WALLEYE             | 3.8% other flatfish<br>ACANTHOPTERYGII<br>PLEURONECTIFORMES                          | 0.2% shallowwater<br>benthic fish<br>SMELT, NIGHT            | 2.6% Macrobenthos<br>CARDITIDAE                        |
| 1.9% commercial<br>shrimp<br>PANDALUS JORDANI               | 0.1% meiobenthos<br>NEMATODA                        | 1.7% macrobenthos<br>EUCARIDA<br>DECAPODA<br>NATANTS         | 1.0% macrobenthos<br>EUCARIDA<br>DECAPODA<br>NATANTS | 2.9% rock sole<br>SOLE, ROCK                                                         | <0.001% jellies/<br>macrozooplankton<br>HYDROZOA<br>HYDROIDA | 2.1% Macrobenthos<br>PAGURIDAE                         |
| 1.8% macrobenthos<br>ARTHROPODA<br>MANDIBULATA<br>CRUSTACEA |                                                     | 1.5% macrobenthos<br>ARTHROPODA<br>MANDIBULATA<br>CRUSTACEA  | 0.8% shallowwater<br>benthic fish<br>AGONIDAE        | 2.5% epibenthos<br>CRANGON SPP.                                                      | <0.001% meiobenthos<br>NEMATODA                              | 1.8% Macrobenthos<br>PAGURUS SPP.                      |
| 1.5% inshore rockfish<br>SEBASTES SPP.                      |                                                     | 1.4% commercial<br>shrimp<br>PANDALUS TRIDENS                | 0.6% salmon<br>PROTACANTHOPTERYGII<br>SALMONIFORMES  | 2.0% other flatfish<br>PLEURONECTIDAE                                                | <0.001% predatory<br>mesozooplankton<br>HYPERIIDAE           | 1.3% Ratfish<br>HYDROLAGUS<br>COLLIEI                  |

\*the diet grouping is followed by the genus or species name.



**Table 6.** Top ten species (by weight) in stomachs of the crab feeders. Weight is expressed as a proportion of all diet items for all hauls pooled.

| BIG SKATE                                                        | SEBASTES BABCOCKI                                    | LONGNOSE SKATE                                               | PACIFIC HALIBUT                                             | RATFISH                                                   |
|------------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------|
| 26.3% macrobenthos<br>EUCARIDA DECAPODA<br>PLEOCYEMATA BRACHYURA | 40.2% macrobenthos<br>EUCARIDA DECAPODA<br>NATANTS   | 24.4% macrobenthos<br>CANCER BRANNERI                        | 10.4% macrobenthos<br>CARDITIDAE                            | 28.7% macrobenthos<br>MOLLUSCA BIVALVIA                   |
| 16.5% forage fish<br>AMMODYTES HEXAPTERUS                        | 20.0% commercial shrimp<br>PANDALUS JORDANI          | 23.0% macrobenthos<br>CANCER GRACILIS                        | 10.1% forage fish<br>AMMODYTES HEXAPTERUS                   | 10.9% macrobenthos<br>ARTHROPODA<br>MANDIBULATA CRUSTACEA |
| 13.5% macrobenthos<br>CANCER GRACILIS                            | 17.2% other fish<br>OSTEICHTHYES                     | 10.8% other flatfish<br>ACANTHOPTERYGII<br>PLEURONECTIFORMES | 9.8% turbot<br>FLOUNDER, ARROWTOOTH                         | 8.5% macrobenthos<br>MOLLUSCA GASTROPODA                  |
| 8.3% other fish<br>OSTEICHTHYES                                  | 4.8% meiobenthos<br>NEMATODA                         | 8.4% macrobenthos<br>REPTANTIA                               | 8.2% other fish<br>OSTEICHTHYES                             | 7.1% macrobenthos<br>OPHIUROIDEA                          |
| 6.2% macrobenthos<br>CANCER PRODUCTUS                            | 3.1% predatory invertebrates<br>MOLLUSCA CEPHALOPODA | 6.9% macrobenthos<br>CANCER PRODUCTUS                        | 6.6% macrobenthos<br>MOLLUSCA BIVALVIA                      | 7.0% macrobenthos<br>PAGURIDAE                            |
| 5.5% macrobenthos<br>CANCER BRANNERI                             | 3.0% small squid<br>ROSSIA PACIFICA                  | 6.4% forage fish<br>AMMODYTES HEXAPTERUS                     | 6.3% herring<br>HERRING, PACIFIC                            | 5.3% macrobenthos<br>YOLDIA SCISSURATA                    |
| 3.8% macrobenthos<br>PAGURIDAE                                   | 2.1% commercial shrimp<br>PANDALUS SPP.              | 4.1% macrobenthos<br>PAGURUS SPP.                            | 6.3% macrobenthos<br>CANCER BRANNERI                        | 5.2% meiobenthos<br>POLYCHAETA                            |
| 3.5% macrobenthos<br>EUCARIDA DECAPODA<br>NATANTS                | 2.0% other flatfish<br>PLEURONECTIDAE                | 3.4% epibenthos<br>CRANGON SPP.                              | 4.8% macrobenthos<br>CANCER PRODUCTUS                       | 2.4% other fish<br>OSTEICHTHYES                           |
| 2.6% other flatfish<br>PLEURONECTIDAE                            | 1.2% forage fish<br>AMMODYTES HEXAPTERUS             | 2.8% epibenthos<br>CRANGON ALBA                              | 4.4% macrobenthos<br>CANCER GRACILIS                        | 2.2% macrobenthos<br>EUCARIDA DECAPODA<br>NATANTS         |
| 1.8% other flatfish<br>ACANTHOPTERYGII<br>PLEURONECTIFORMES      | 1.1% shallowwater benthic fish<br>PRICKLEBACK, SNAKE | 1.9% macrobenthos<br>POLINICES LEWISI                        | 3.5% other flatfish<br>ACANTHOPTERYGII<br>PLEURONECTIFORMES | 1.9% salmon<br>SALMON, PINK                               |

**Table 7.** Top ten species (by weight) in stomachs of the annelid feeders. Weight is expressed as a proportion of all diet items for all hauls pooled.

| DOVER SOLE                               | ENGLISH SOLE                              | REX SOLE                               | ROCK SOLE                                 |
|------------------------------------------|-------------------------------------------|----------------------------------------|-------------------------------------------|
| 24.4% meiobenthos<br>POLYCHAETA          | meiobenthos<br>POLYCHAETA                 | 17.4% epibenthos<br>CRANGON ALBA       | 40.3% forage fish<br>AMMODYTES HEXAPTERUS |
| 10.9% macrobenthos<br>CNIDARIA           | 8.2% forage fish<br>AMMODYTES HEXAPTERUS  | 16.8% macrobenthos<br>ECHIURA          | 8.2% macrobenthos<br>MOLLUSCA BIVALVIA    |
| 6.1% macrobenthos<br>OPHIUROIDEA         | 6.1% meiobenthos<br>TRAVISIA JAPONICA     | 11.4% macrobenthos<br>PINNIXA SCHMITTI | 7.5% meiobenthos<br>NEPHTYIDAE            |
| 3.4% meiobenthos<br>ONUPHIS SPP          | 6.0% macrobenthos<br>MOLLUSCA BIVALVIA    | 8.7% meiobenthos<br>POLYCHAETA         | 7.0% meiobenthos<br>NEPHTYS SPP.          |
| 3.0% macrobenthos<br>MOLLUSCA BIVALVIA   | 3.5% macrobenthos<br>ECHIURUS ECHIURUS    | 4.8% meiobenthos<br>LUMBRINERIDAE      | 6.5% meiobenthos<br>POLYCHAETA            |
| 2.6% macrobenthos<br>OPHIURA SARSI       | 2.6% macrobenthos<br>ECHIURA              | 4.6% macrobenthos<br>PINNIXA SPP.      | 3.5% macrobenthos<br>PAGURUS SPP.         |
| 2.3% macrobenthos<br>PINNIXA SCHMITTI    | 2.4% macrobenthos<br>OPHIUROIDEA          | 4.5% meiobenthos<br>ONUPHIS SPP        | 3.1% other fish<br>OSTEICHTHYES           |
| 2.3% macrobenthos<br>OPHIURA LUETKENI    | 2.3% meiobenthos<br>LUMBRINERIS BICIRRATA | 3.6% macrobenthos<br>ECHIURUS ECHIURUS | 2.9% macrobenthos<br>PAGURIDAE            |
| 2.0% meiobenthos<br>POLYNOIDAE           | 1.8% macrobenthos<br>NUCULANIDAE          | 2.9% meiobenthos<br>POLYNOIDAE         | 1.8% macrobenthos<br>CANCER BRANNERI      |
| 2.0% 37.2% meiobenthos<br>PHYLLODOCE SPP | 1.7% meiobenthos<br>RHYNCHOCOELA          | 2.3% macrobenthos<br>MOLLUSCA BIVALVIA | 1.4% other fish<br>UNID. FISH             |

**Table 8.** Top ten species (by weight) in stomachs of the shrimp feeders. Weight is expressed as a proportion of all diet items for all hauls pooled.

| BLACK SKATE                                              | SPECKLED SANDDAB                                            | WALLEYE POLLOCK                                             | FLATHEAD SOLE                                                |
|----------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------|
| 12.5% epibenthos<br>CRANGON COMMUNIS                     | 27.9% epibenthos<br>CRANGON ALBA                            | 61.0% commercial shrimp<br>PANDALUS TRIDENS                 | 36.8% commercial shrimp<br>PANDALUS TRIDENS                  |
| 11.9% macrobenthos<br>PAGURUS SPP.                       | 20.1% epibenthos<br>CRANGON SPP.                            | 7.2% epibenthos<br>MYSIDACEA                                | 25.4% commercial shrimp<br>PANDALUS SPP.                     |
| 11.5% macrobenthos<br>OREGONIA GRACILIS                  | 13.7% forage fish<br>AMMODYTES HEXAPTERUS                   | 4.7% macrobenthos<br>ARTHROPODA MANDIBULATA<br>CRUSTACEA    | 12.2% epibenthos<br>EUCARIDA DECAPODA<br>PLEOCYEMATA CARIDEA |
| 9.6% meiobenthos<br>POLYCHAETA                           | 8.0% macrobenthos<br>MALACOSTRACA<br>EUMALACOSTRACA         | 3.7% euphausiids<br>EUCARIDA EUPHAUSIACEA                   | 4.5% macrobenthos<br>OPHIURA LUETKENI                        |
| 7.4% macrobenthos<br>EUCARIDA DECAPODA NATANTS           | 4.2% epibenthos<br>CRANGONIDAE                              | 3.1% euphausiids<br>THYSANOESSA SPINIFERA                   | 4.4% epibenthos<br>NEOMYSIS KADIAKENSIS                      |
| 7.2% epibenthos<br>CRANGONIDAE                           | 3.9% macrobenthos<br>ARTHROPODA MANDIBULATA<br>CRUSTACEA    | 2.8% euphausiids<br>EUPHAUSIIDAE                            | 3.2% epibenthos<br>HEPTACARPUS STYLUS                        |
| 6.9% epibenthos<br>CRANGON ALBA                          | 3.9% macrobenthos<br>EUCARIDA DECAPODA NATANTS              | 2.3% other fish<br>UNID. FISH                               | 3.1% epibenthos<br>CRANGON ALBA                              |
| 6.7% macrobenthos<br>ARTHROPODA MANDIBULATA<br>CRUSTACEA | 2.7% epibenthos<br>EUCARIDA DECAPODA<br>PLEOCYEMATA CARIDEA | 2.2% epibenthos<br>EUCARIDA DECAPODA<br>PLEOCYEMATA CARIDEA | 1.8% macrobenthos<br>EUCARIDA DECAPODA NATANTS               |
| 4.4% epibenthos<br>CRANGON SPP.                          | 2.5% epibenthos<br>EXACANTHOMYSIS ALASKENSIS                | 1.7% other fish<br>OSTEICHTHYES                             | 1.5% epibenthos<br>CRANGON SPP.                              |
| 3.5% predatory mesozooplankton<br>ANONYX SPP.            | 1.7% other fish<br>UNID. FISH                               | 1.5% macrobenthos<br>EUCARIDA DECAPODA NATANTS              | 1.3% other fish<br>UNID. FISH                                |

**Table 9.** Top ten species (by weight) in stomachs of the euphausiid feeders. Weight is expressed as a proportion of all diet items for all hauls pooled.

| EULACHON                                                     | SEBASTES<br>ELONGATUS                                           | SEBASTES FLAVIDUS                                           | SEBASTES ALUTUS                                                | SABLEFISH                                              | PACIFIC SANDDAB                                             |
|--------------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------|
| 52.7% euphausiids<br>EUCARIDA<br>EUPHAUSIACEA                | 82.2% euphausiids<br>EUCARIDA<br>EUPHAUSIACEA                   | 31.0% euphausiids<br>EUCARIDA<br>EUPHAUSIACEA               | 71.8% euphausiids<br>THYSANOESSA<br>SPINIFERA                  | 52.2% Euphausiids<br>THYSANOESSA<br>SPINIFERA          | 33.9% euphausiids<br>EUCARIDA<br>EUPHAUSIACEA               |
| 40.7% macrobenthos<br>ARTHROPODA<br>MANDIBULATA<br>CRUSTACEA | 11.1% macrobenthos<br>EUCARIDA DECAPODA<br>NATANTS              | 20.7% commercial shrimp<br>PANDALUS TRIDENS                 | 13.6% euphausiids<br>EUCARIDA<br>EUPHAUSIACEA                  | 16.0% other fish<br>UNID. FISH                         | 33.9% epibenthos<br>MYSIDACEA                               |
| 5.9% euphausiids<br>EUPHAUSIA PACIFICA                       | 5.7% other fish<br>OSTEICHTHYES                                 | 15.0% euphausiids<br>THYSANOESSA<br>SPINIFERA               | 4.7% macrobenthos<br>EUCARIDA DECAPODA<br>NATANTS              | 5.5% Euphausiids<br>EUCARIDA<br>EUPHAUSIACEA           | 4.5% euphausiids<br>THYSANOESSA<br>SPINIFERA                |
|                                                              | 0.1% macrobenthos<br>ARTHROPODA<br>MANDIBULATA<br>CRUSTACEA     | 6.9% macrobenthos<br>EUCARIDA DECAPODA<br>= NATANTS         | 2.3% copepods<br>COPEPODA CALANOIDA                            | 2.9% Herring<br>HERRING, PACIFIC                       | 4.1% macrobenthos<br>ARTHROPODA<br>MANDIBULATA<br>CRUSTACEA |
|                                                              | 0.1% predatory<br>mesozooplankton<br>AMPELISCA<br>MACROCEPHALA  | 6.8% euphausiids<br>EUPHAUSIIDAE                            | 1.4% macrobenthos<br>ARTHROPODA<br>MANDIBULATA<br>CRUSTACEA    | 2.7% commercial shrimp<br>PANDALUS TRIDENS             | 4.1% epibenthos<br>ARGIS ALASKENSIS                         |
|                                                              | <0.001% predatory<br>mesozooplankton<br>PERACARIDA<br>AMPHIPODA | 4.6% euphausiids<br>EUCARIDA                                | 1.1% predatory<br>mesozooplankton<br>RHACHOTROPIS SPP.         | 2.6% Dogfish<br>SQUALUS ACANTHIAS                      | 3.3% other fish<br>OSTEICHTHYES                             |
|                                                              |                                                                 | 3.6% macrobenthos<br>CLIONE LIMACINA                        | 1.1% epibenthos<br>EUCARIDA DECAPODA<br>PLEOCYEMATA<br>CARIDEA | 2.6% Macrobenthos<br>HYDROZOA HYDROIDA<br>ANTHOMEDUSAE | 2.7% epibenthos<br>NEOMYSIS<br>KADIAKENSIS                  |
|                                                              |                                                                 | 2.5% macrobenthos<br>ARTHROPODA<br>MANDIBULATA<br>CRUSTACEA | 0.7% epibenthos<br>CRANGON SPP.                                | 2.0% forage fish<br>AMMODYTES<br>HEXAPTERUS            | 1.7% turbot<br>FLOUNDER,<br>ARROWTOOTH                      |
|                                                              |                                                                 | 1.6% other fish<br>UNID. FISH                               | 0.6% macrobenthos<br>LIMACINA HELICINA<br>(CJL)                | 1.9% Macrobenthos<br>MOLLUSCA<br>GASTROPODA            | 1.7% other flatfish<br>PLEURONECTIDAE                       |
|                                                              |                                                                 | 1.2% forage fish<br>AMMODYTES SPP.                          | 0.5% epibenthos<br>MYSIDACEA                                   | 1.4% Macrobenthos<br>CLIONE LIMACINA                   | 1.6% macrobenthos<br>EUCARIDA DECAPODA<br>NATANTS           |

**Table 10.** Diet breadth and proportion of fish in the diets of the predators for the four cruises.

| PREDATOR                   | CRUISE        |           |             |           |               |           |               |           |
|----------------------------|---------------|-----------|-------------|-----------|---------------|-----------|---------------|-----------|
|                            | 1 SUMMER 1985 |           | 2 FALL 1985 |           | 3 WINTER 1986 |           | 4 SUMMER 1987 |           |
|                            | % fish        | No. items | % fish      | No. items | % fish        | No. items | % fish        | No. items |
| <b>Dogfish</b>             | 0.5459        | 13        | 0.5374      | 17        | 0.9344        | 9         | 0.7582        | 10        |
| <b>Big skate</b>           | 0             | 3         | 0.3052      | 9         | 0.5299        | 7         |               |           |
| <b>Black skate</b>         | 0.0008        | 7         | 0.0215      | 5         | 0             | 2         |               |           |
| <b>Longnose skate</b>      | 0.1177        | 6         | 0.3281      | 4         |               |           |               |           |
| <b>Ratfish</b>             | 0.0058        | 7         | 0.0445      | 7         | 0.0699        | 12        |               |           |
| <b>Pacific cod</b>         | 0.5066        | 13        | 0.8967      | 15        | 0.7446        | 19        | 0.6036        | 13        |
| <b>Walleye pollock</b>     | 0.0283        | 11        | 0.0972      | 7         | 0             | 6         |               |           |
| <b>Pacific ocean perch</b> | 0.0109        | 7         | 0           | 5         |               |           |               |           |
| <b>Redbanded Rockfish</b>  | 0             | 1         | 0.2391      | 12        |               |           |               |           |
| <b>Yellowtail rockfish</b> | 0.052         | 13        | 0.0201      | 9         | 0.0458        | 10        |               |           |
| <b>Sablefish</b>           | 0.4384        | 11        | 0.1892      | 11        |               |           |               |           |
| <b>Pacific Sanddab</b>     |               |           | 0.0808      | 8         | 0.0025        | 9         |               |           |
| <b>Arrowtooth flounder</b> | 0.5745        | 9         | 0.8678      | 12        | 0.5605        | 11        |               |           |
| <b>Petrale sole</b>        | 0             | 3         | 0.261       | 11        | 0.9633        | 10        |               |           |
| <b>Rex sole</b>            | 0             | 7         | 0.0015      | 9         | 0             | 6         |               |           |
| <b>Flathead sole</b>       | 0             | 3         | 0.0145      | 7         | 0             | 2         |               |           |
| <b>Pacific halibut</b>     | 0.122         | 7         | 0.7353      | 18        | 0.8215        | 8         |               |           |
| <b>Rock sole</b>           | 0.1875        | 8         | 0.8612      | 10        | 0.713         | 9         |               |           |
| <b>Dover sole</b>          | 0             | 6         | 0.0001      | 10        | 0             | 1         |               |           |
| <b>English sole</b>        | 0.0042        | 9         | 0.4676      | 8         | 0             | 7         |               |           |
| <b>Sand sole</b>           | 0.8235        | 11        | 0.9677      | 8         | 0.8833        | 4         |               |           |

**Table 11.** Most common benthic species identified in areas A-D from grab samples taken from three cruises between June 1985 and January 1986 in Hecate Strait (Burd and Brinkhurst 1987) as compared with the most common diet components for the benthivores English sole, Dover sole, and rex sole. Adult and juvenile diets are pooled in all cases.

| Area | Predominant benthic fauna identified from grab samples                                                                                                                                                                                                                                                                                                                                                                                      | English sole diet                                                                                                                                                                                                     | Dover sole diet                                                                                                                                                                                                                                                   | Rex Sole diet                                                                                                                                                                                                                                          |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A    | All cruises: polychaetes: <i>Lumbrineris luti</i> , <i>Prionospio steenstrupi</i> , <i>Spiophanes berkleyorum</i> , <i>Galathowenia oculata</i> , <i>Euchlymene zonalis</i> , <i>Owenia fusiformis</i> , <i>Polycirrus</i> sp., <i>Mediomastus</i> sp.<br>Cruise 2&3 only: <i>Decamastus gracilis</i> ; Cruise 3 only: <i>Polycirrus</i> complex.<br>Also common: bivalve: <i>Axinopsida serricata</i> and amphipod <i>Rhepoxyniuis</i> sp. | 23.6% sandlance,<br>14.9% polychaetes,<br>12% bivalves, 10%<br><i>Echiurus echiurus</i> ,<br>7% Echiurans, 6%<br>Nuculanidae<br>bivalves, rest <3%<br>by weight of diet                                               | 21.4% Cnidaria,<br>12.4% polychaetes,<br>6.5% <i>Onuphis</i> sp.,<br>4.6% bivalves, 4.6%<br><i>Pinnixa schmitti</i> ,<br>3.8% Phyllodoce,<br>3.6% Nephytidae,<br>3.4% Polynoidae,<br>3.3% <i>Pinnixa</i> sp.<br>3.2% Maldanidae,<br>rest <3% by weight<br>of diet | 27.3% <i>Echiura</i> sp.,<br>26.9% Crangon<br>alba, 6.6% <i>Pinnixa<br/>schmitti</i> , 5.2%<br><i>Pinnixa</i> sp., 4.2%<br><i>Echiura echiura</i> ,<br>3.8% <i>Onuphis</i> sp.,<br>3.5% Polynoidae,<br>5% polychaetes rest<br><3% by weight of<br>diet |
| B    | All cruises: polychaetes: <i>Spiophanes bombyx</i> , <i>Magelona hobsonae</i> , Euclymenidae, <i>Hemipodus borealis</i> ; the bivalve <i>Tellina nuculoides</i> ; and amphipod <i>Foxiphalis obtusidens</i> . Cruise 3 only: echinoid: <i>Dendraster excentricus</i>                                                                                                                                                                        | 54% polychaetes,<br>23.7% Crangon sp.,<br>8% bivalves, 5.1%<br>Spionidae, rest <3%<br>by weight of diet                                                                                                               | N/A                                                                                                                                                                                                                                                               | N/A                                                                                                                                                                                                                                                    |
| C    | All cruises: polychaetes: <i>Spiochaetopterus costarum</i> , <i>Galathowenia oculata</i> , <i>Owenia fusiformis</i> , <i>Myriochele heeri</i> and <i>Odostomia</i> sp.; the bivalves, <i>Psephidia lordi</i> and <i>Azionopsida serricata</i> ; and amphipod <i>Ampelisca macrocephala</i> .                                                                                                                                                | 39% polychaetes,<br>6.5% Ophiuroidea,<br>6.1% <i>Ophiura<br/>luetkeni</i> , 4.5% <i>O.<br/>sarsi</i> , 3.9%<br><i>Terebellides<br/>stroemii</i> , 3.5%<br><i>Glycera Americana</i> ,<br>rest <3% by weight<br>of diet | 37.1% polychaetes,<br>12.5% Ophiuroidea,<br>5.4% <i>Ophiura sarsi</i> ,<br>3.6% <i>Lepidasthenia<br/>longicissata</i> , 3.5%<br><i>O. luetkeni</i> , 3.3%<br>Holothuroidea,<br>rest <3% by weight<br>of diet                                                      | 25.6% polychaetes,<br>13.6%<br>Lumbrineridae,<br>5.3% Glyceridae,<br>4.4% <i>Lumbrineris<br/>bicirrata</i> , 3.4%<br><i>Travisia</i> sp., rest<br><3% by weight of<br>diet                                                                             |
| D    | All cruises: polychaetes: <i>Spiophanes bombyx</i> ,                                                                                                                                                                                                                                                                                                                                                                                        | 52.6% polychaetes,                                                                                                                                                                                                    | 28.5% Paguridae,                                                                                                                                                                                                                                                  | 50% <i>Pinnixa</i>                                                                                                                                                                                                                                     |



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|                                                                                                                                                                                                  |       |                      |       |                                |                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------|-------|--------------------------------|----------------------------------|
| <i>Polycirrus</i> complex and <i>Spiochaetopterus costarum</i> ;<br>the bivalve <i>A. serricata</i> ; and amphipods <i>Grandifoxis</i><br>sp. and <i>Foxiphalus</i> sp. (both in cruise 3 only). | 13.4% | <i>Travisia</i>      | 24.4% | polychaetes, <i>schmitti</i> , | 8.7%                             |
|                                                                                                                                                                                                  |       | <i>japonica</i> ,    | 4%    | 15.8% <i>Onuphis</i>           | <i>Pinnixa</i> sp., 4.6%         |
|                                                                                                                                                                                                  |       | <i>Lumbrineris</i>   |       | <i>iridescens</i> ,            | 15.5% <i>Onuphis</i> sp., 4.6%   |
|                                                                                                                                                                                                  |       | <i>bicirrata</i> ,   | 4%    | <i>Glycera</i> sp.             | 14.1% <i>Crangon alba</i> , 4.2% |
|                                                                                                                                                                                                  |       | <i>Rhyncocoela</i> , | 3%    | Eucarida decapoda,             | polychaetes, 3.8%                |
|                                                                                                                                                                                                  |       | bivalves, rest       | <3%   | 6.8% Nereidae, rest            | Goniadidae, 3.7%                 |
|                                                                                                                                                                                                  |       | by weight of diet    |       | <3% by weight of               | <i>Glycera</i> sp., rest         |
|                                                                                                                                                                                                  |       |                      |       | diet                           | <3% by weight of                 |
|                                                                                                                                                                                                  |       |                      |       |                                | diet                             |

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Table 12. Predator and Prey overlap indices as output from the Ecopath model. Overlaps greater than 50% are shown in bold.

### Predator Overlap

|                     | Ratfish | Dogfish | Skates | Juv POP | Ad POP | Dover sole | Arrowtooth flounder | Juv Rock sole | Ad Rock sole | Juv English sole | Ad English sole | Ling cod | Hali but | Juv Pacific cod | Ad Pacific cod | Juv Sablefish |
|---------------------|---------|---------|--------|---------|--------|------------|---------------------|---------------|--------------|------------------|-----------------|----------|----------|-----------------|----------------|---------------|
| Ratfish             | 1       |         |        |         |        |            |                     |               |              |                  |                 |          |          |                 |                |               |
| Dogfish             |         | 1       |        |         |        |            |                     |               |              |                  |                 |          |          |                 |                |               |
| Skates              |         |         | 1      |         |        |            |                     |               |              |                  |                 |          |          |                 |                |               |
| Juv POP             |         |         |        | 1       |        |            |                     |               |              |                  |                 |          |          |                 |                |               |
| Ad POP              |         |         |        |         | 1      |            |                     |               |              |                  |                 |          |          |                 |                |               |
| Dover sole          |         |         |        | 0.991   |        | 1          |                     |               |              |                  |                 |          |          |                 |                |               |
| Arrowtooth flounder |         |         |        | 0.711   |        | 0.736      | 1                   |               |              |                  |                 |          |          |                 |                |               |
| Juv Rock sole       | 0.263   |         |        | 0.94    |        | 0.95       | 0.747               | 1             |              |                  |                 |          |          |                 |                |               |
| Ad Rock sole        |         |         |        |         |        |            |                     |               | 1            |                  |                 |          |          |                 |                |               |
| Juv English sole    | 0.18    |         |        | 0.806   |        | 0.83       | 0.929               | 0.887         |              | 1                |                 |          |          |                 |                |               |
| Ad English sole     |         |         |        |         |        |            |                     |               | 0.914        | 0.029            | 1               |          |          |                 |                |               |
| Lingcod             |         |         |        |         |        |            | 0.157               |               |              |                  |                 | 1        |          |                 |                |               |
| Halibut             |         |         |        |         |        |            |                     |               |              |                  |                 |          | 1        |                 |                |               |
| Juv Pacific cod     |         |         |        | 0.08    |        | 0.101      | 0.078               | 0.086         | 0.458        | 0.085            | 0.485           |          |          | 1               |                |               |
| Ad Pacific cod      |         |         |        |         |        |            |                     |               | 0.587        |                  | 0.583           |          |          | 0.887           | 1              |               |
| Juv Sablefish       |         |         |        |         |        |            |                     |               |              |                  |                 |          | 1        |                 |                | 1             |

### Prey Overlap

|         | Ratfish | Dogfish | Skates | Juv POP | Ad POP | Dover sole | Arrowtooth flounder | Juv Rock sole | Ad Rock sole | Juv English sole | Ad English sole | Ling cod | Hali but | Juv Pacific cod | Ad Pacific cod | Juv Sablefish |
|---------|---------|---------|--------|---------|--------|------------|---------------------|---------------|--------------|------------------|-----------------|----------|----------|-----------------|----------------|---------------|
| Ratfish |         |         |        |         |        |            |                     |               |              |                  |                 |          |          |                 |                |               |
| Dogfish | 0.327   | 1       |        |         |        |            |                     |               |              |                  |                 |          |          |                 |                |               |
| Skates  | 0.918   | 0.591   | 1      |         |        |            |                     |               |              |                  |                 |          |          |                 |                |               |
| Juv POP | 0.156   | 0.143   | 0.145  | 1       |        |            |                     |               |              |                  |                 |          |          |                 |                |               |
| Ad POP  | 0.005   | 0.086   | 0.002  | 0.973   | 1      |            |                     |               |              |                  |                 |          |          |                 |                |               |

|                        |       |       |       |       |       |       |       |       |       |       |       |      |      |      |  |      |       |  |   |
|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|--|------|-------|--|---|
| Dover sole             | 0.579 | 0.233 | 0.579 | 0.096 | 0.003 | 1     |       |       |       |       |       |      |      |      |  |      |       |  |   |
| Arrowtooth<br>flounder | 0.209 | 0.946 | 0.465 | 0.154 | 0.112 | 0.141 | 1     |       |       |       |       |      |      |      |  |      |       |  |   |
| Juv Rock<br>sole       | 0.16  | 0.825 | 0.444 | 0.025 | 0.002 | 0.191 | 0.77  | 1     |       |       |       |      |      |      |  |      |       |  |   |
| Ad Rock<br>sole        | 0.623 | 0.616 | 0.695 | 0.088 | 0.001 | 0.876 | 0.507 | 0.57  | 1     |       |       |      |      |      |  |      |       |  |   |
| Juv<br>English<br>sole | 0.41  | 0.302 | 0.371 | 0.053 | 0.004 | 0.93  | 0.233 | 0.353 | 0.886 | 1     |       |      |      |      |  |      |       |  |   |
| Ad English<br>sole     | 0.497 | 0.24  | 0.421 | 0.065 | 0.003 | 0.969 | 0.166 | 0.264 | 0.873 | 0.989 | 1     |      |      |      |  |      |       |  |   |
| Lingcod                | 0.001 | 0.669 | 0.18  |       |       |       | 0.824 | 0.522 | 0.262 | 0.109 | 0.05  | 1    |      |      |  |      |       |  |   |
|                        |       |       |       |       |       |       |       |       |       |       |       | 0.06 |      |      |  |      |       |  |   |
| Halibut                | 0.981 | 0.352 | 0.915 | 0.152 | 0.001 | 0.599 | 0.264 | 0.146 | 0.561 | 0.318 | 0.406 | 8    | 1    |      |  |      |       |  |   |
| Juv Pacific<br>cod     | 0.369 | 0.889 | 0.601 | 0.074 | 0.012 | 0.28  | 0.873 | 0.768 | 0.625 | 0.332 | 0.271 | 0.62 | 6    | 0.37 |  |      |       |  |   |
| Ad Pacific<br>cod      | 0.077 | 0.914 | 0.375 | 0.018 | 0.005 | 0.061 | 0.919 | 0.91  | 0.478 | 0.226 | 0.13  | 0.7  | 1    | 0.10 |  |      |       |  |   |
| Juv                    |       |       |       |       |       |       |       |       |       |       |       | 0.11 | 0.14 |      |  |      |       |  |   |
| Sablefish              | 0.14  | 0.25  | 0.167 | 0.937 | 0.879 | 0.102 | 0.287 | 0.117 | 0.139 | 0.084 | 0.085 | 6    | 4    |      |  | 0.18 | 0.138 |  | 1 |

**Fig. 1.** Location of the four sampling areas within Hecate Strait, British Columbia, taken from Saunders et al. (1986).

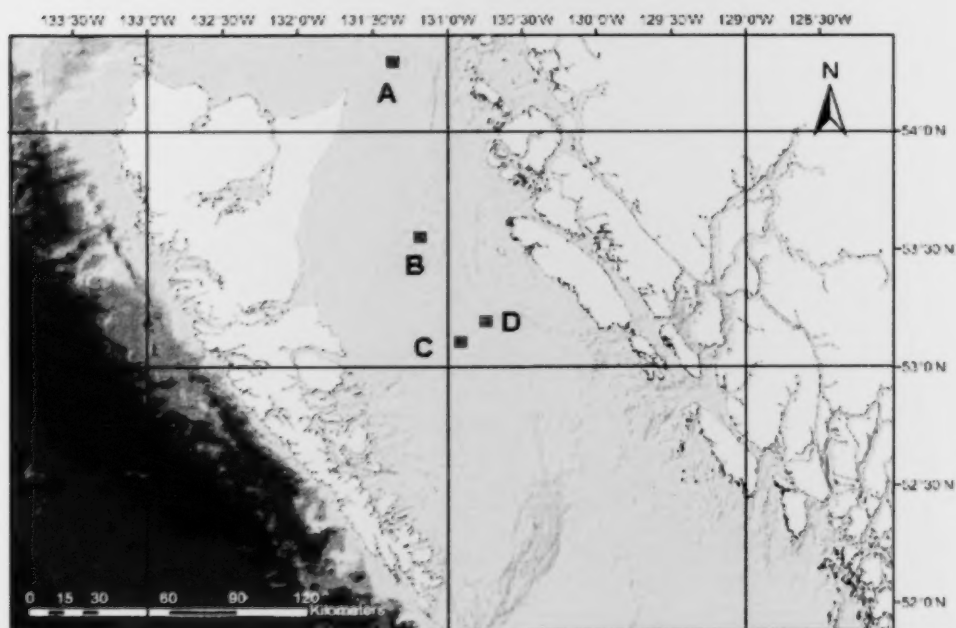


**Fig. 2.** Location of major assemblage areas and their approximate boundaries.

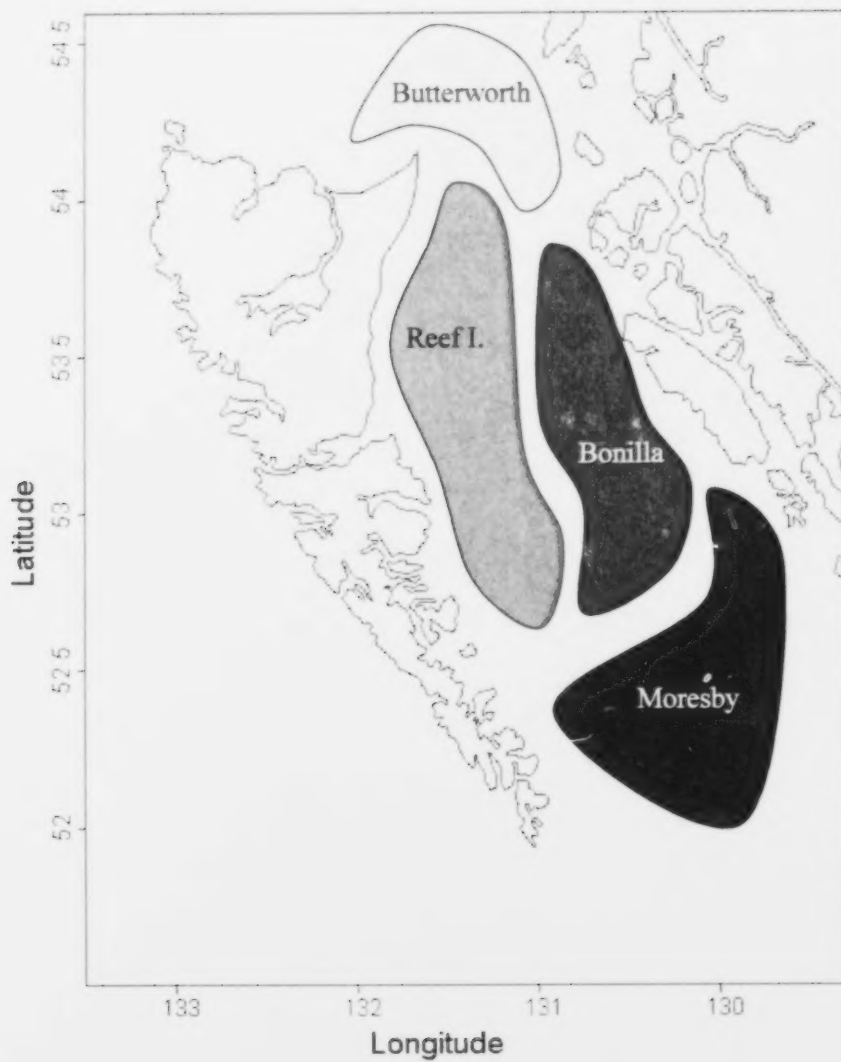


**Fig. 3.** Diet composition (pooled by weight) of adult and juvenile Pacific cod, 1985-1987, all cruises and areas pooled.

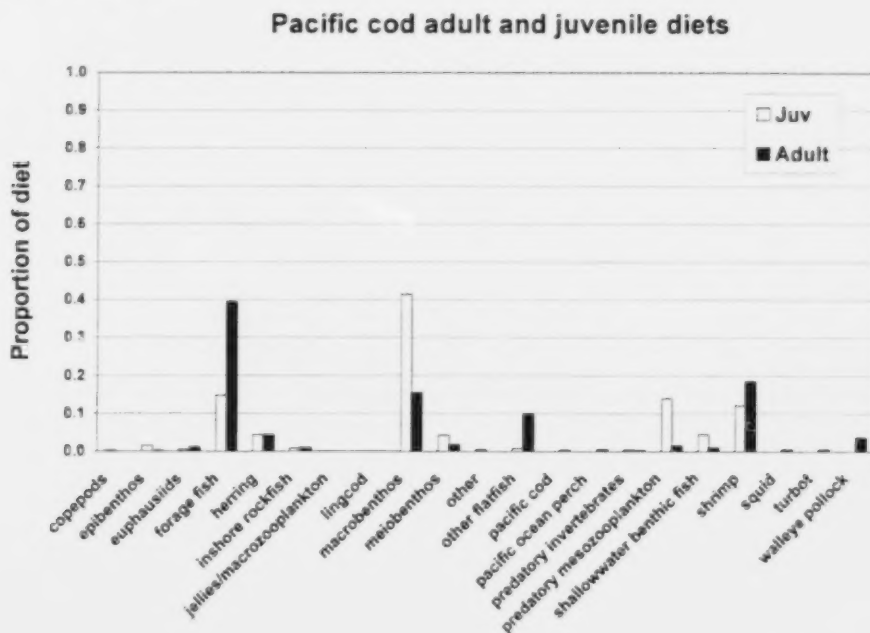


**Fig. 4.** Diet composition (pooled by weight) of adult and juvenile Pacific ocean perch, 1985-1987, all cruises and areas pooled.

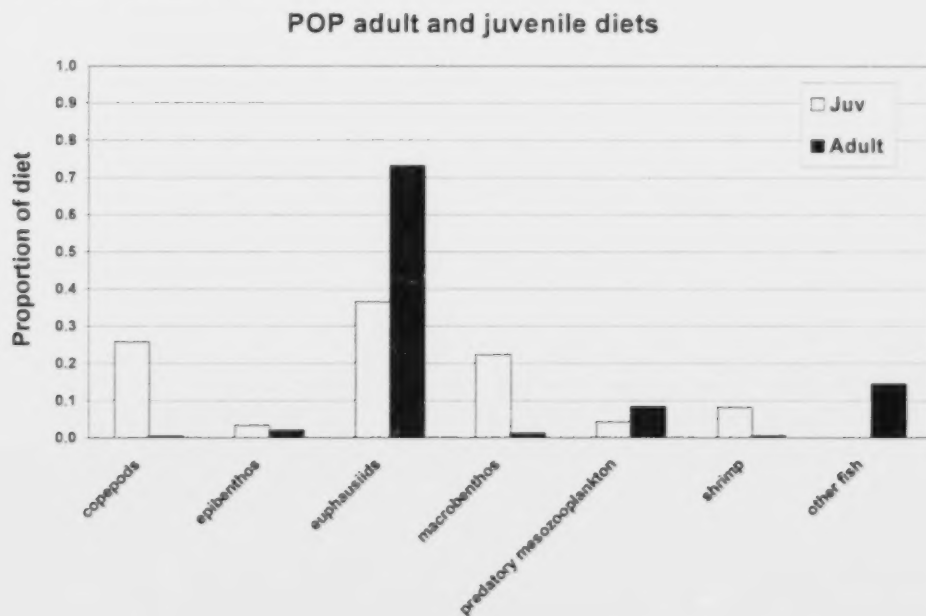




**Fig. 5.** Diet composition (pooled by weight) of adult and juvenile Arrowtooth flounder, 1985-1987, all cruises and areas pooled.

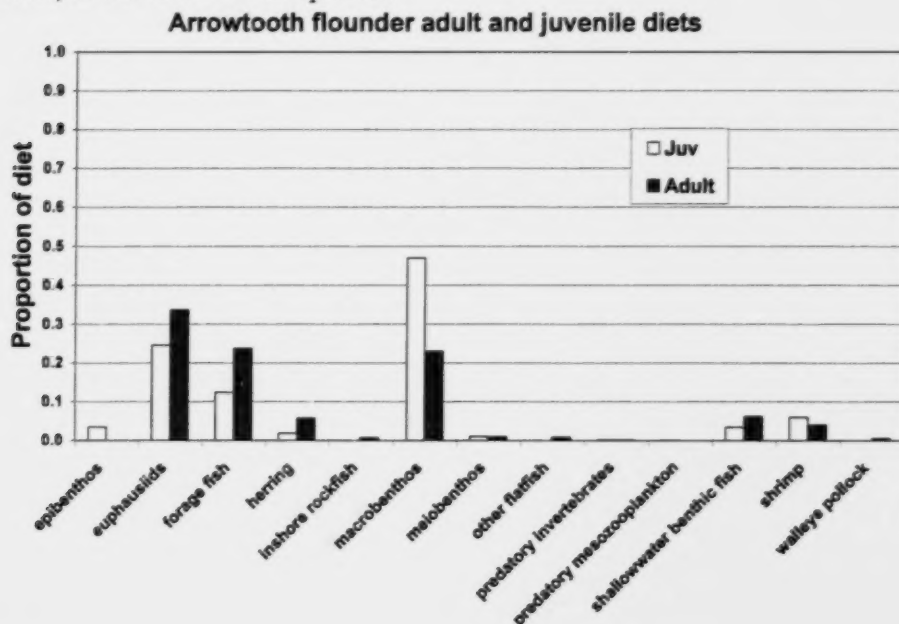


**Fig. 6.** Diet composition (pooled by weight) of adult and juvenile Rock sole, 1985-1987, all cruises and areas pooled.

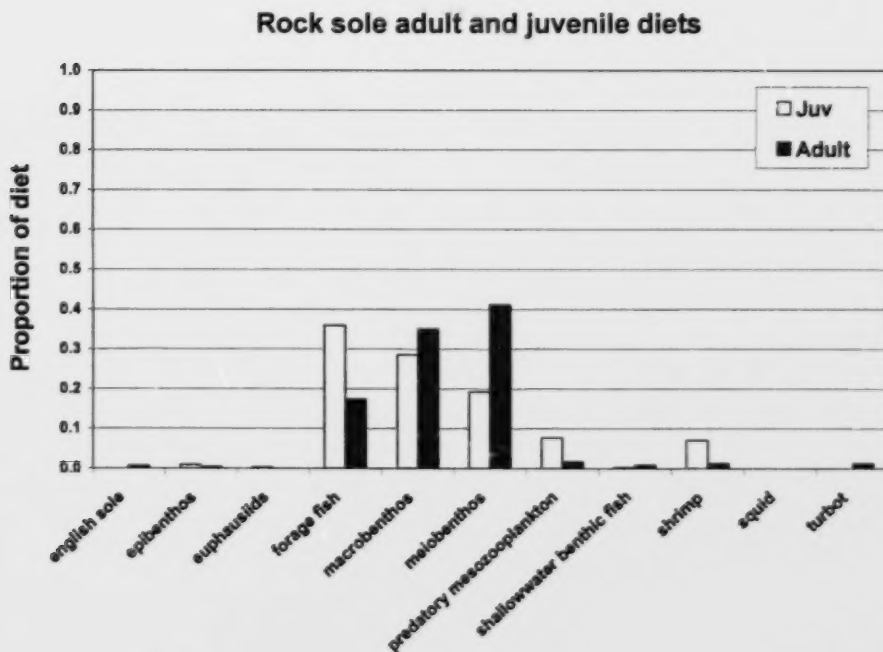


**Fig. 7.** Diet composition (pooled by weight) of adult and juvenile Dover sole, 1985-1987, all cruises and areas pooled.

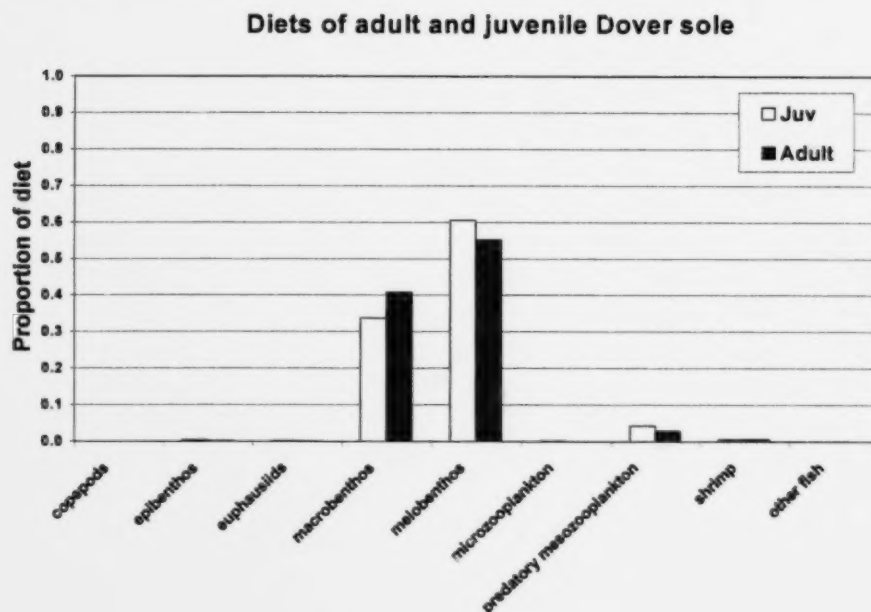


**Fig. 8.** Diet composition (pooled by weight) of adult and juvenile English sole, 1985-1987, all cruises and areas pooled.

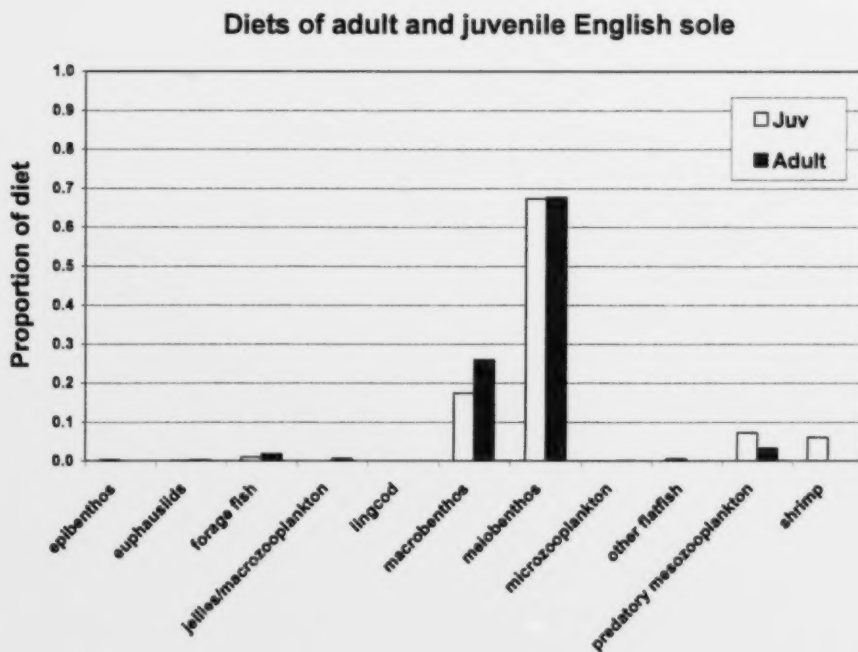


**Fig. 9.** Diet composition (pooled by weight) of adult and juvenile Dogfish, 1985-1987, all cruises and areas pooled.

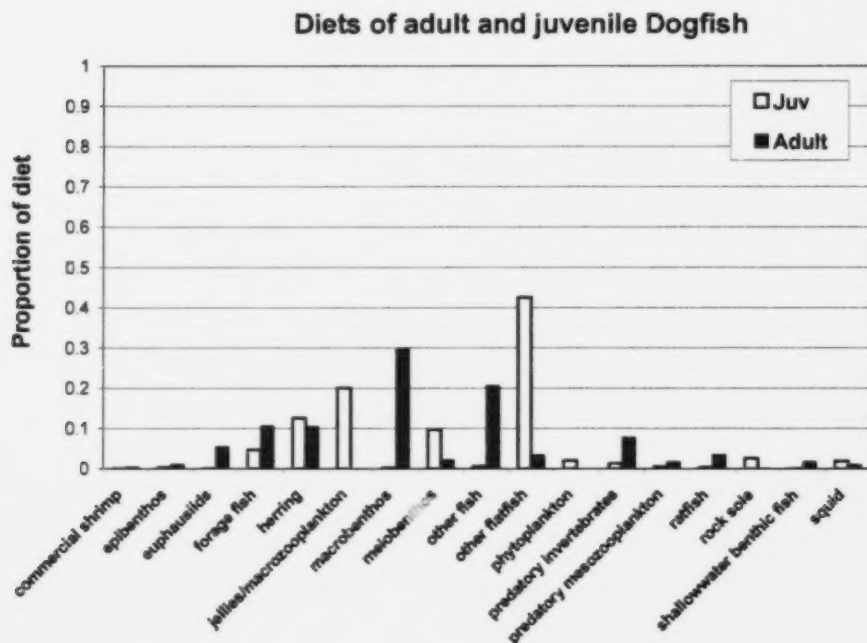


**Fig. 10.** Results of hierarchical cluster analysis of the diets for the species of groundfish collected from Hecate Strait for stomach sampling. Diets used were for 1985-1987, all cruises and areas pooled.

## Cluster Tree

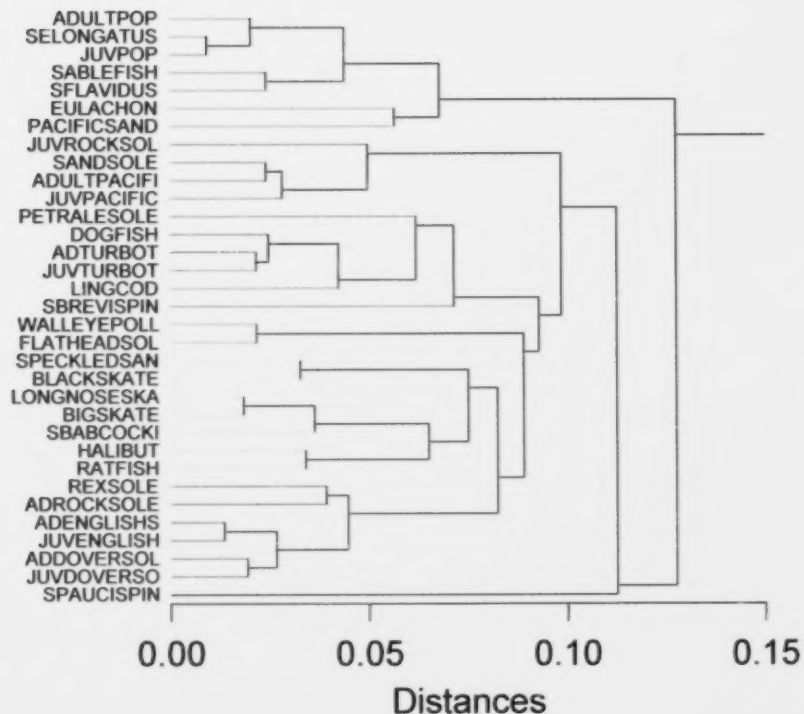


Fig. 11. Proportion of different diet groupings for the euphausiid feeders, 1985-1987.

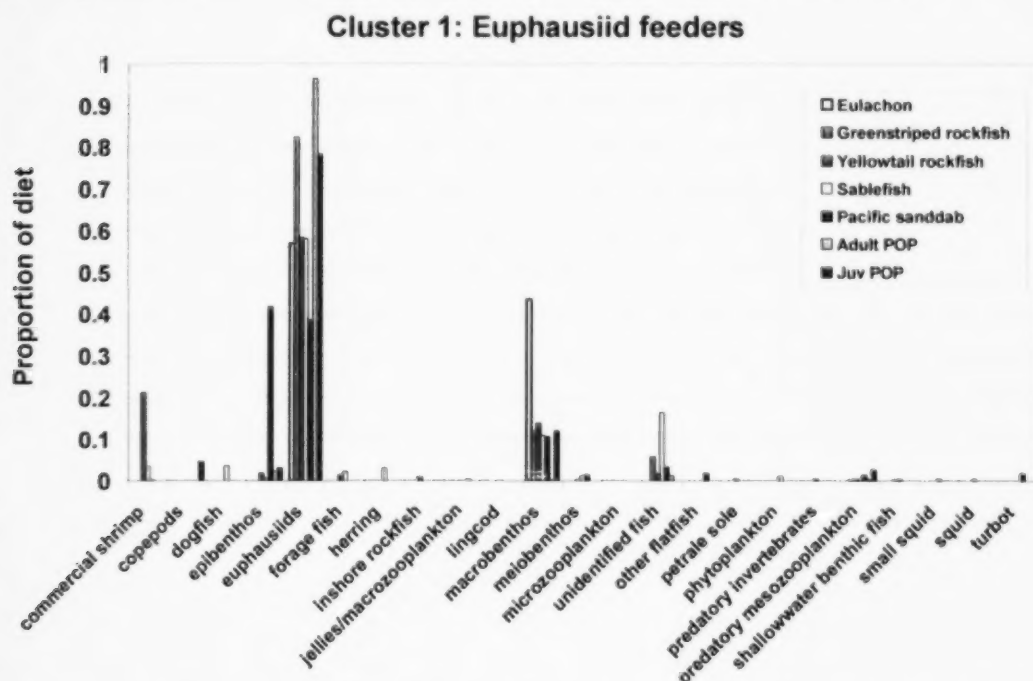


Fig. 12. Proportion of different diet groupings for the macrobenthic/meiobenthic feeders, 1985-1987.

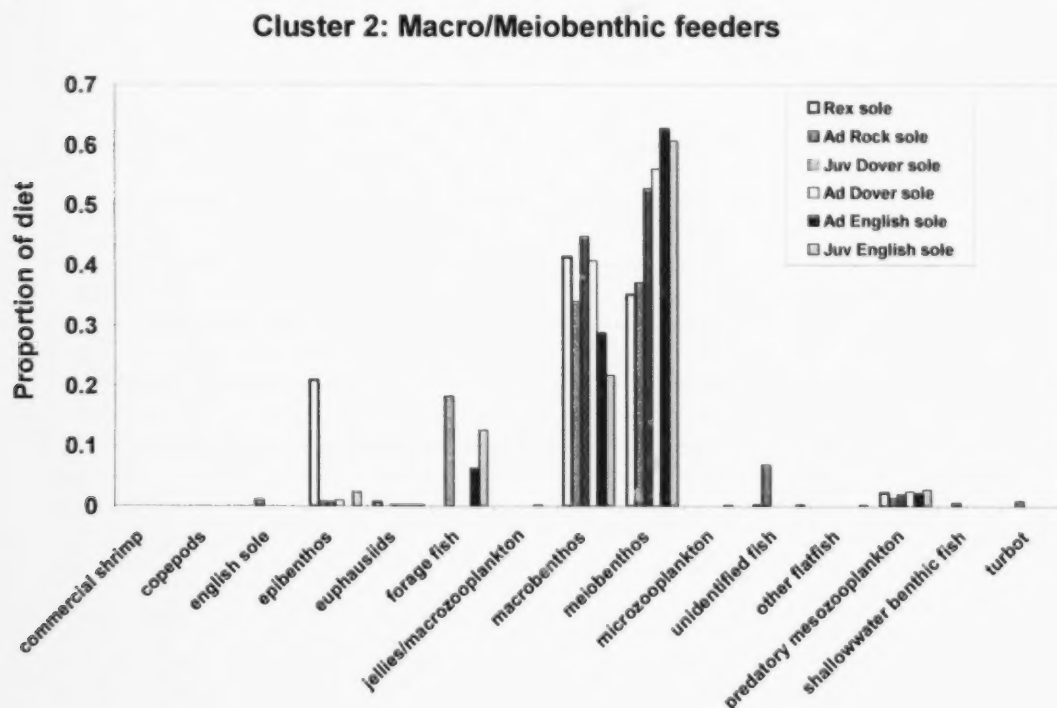


Fig. 13. Proportion of different diet groupings for the macrobenthic feeders, 1985-1987.

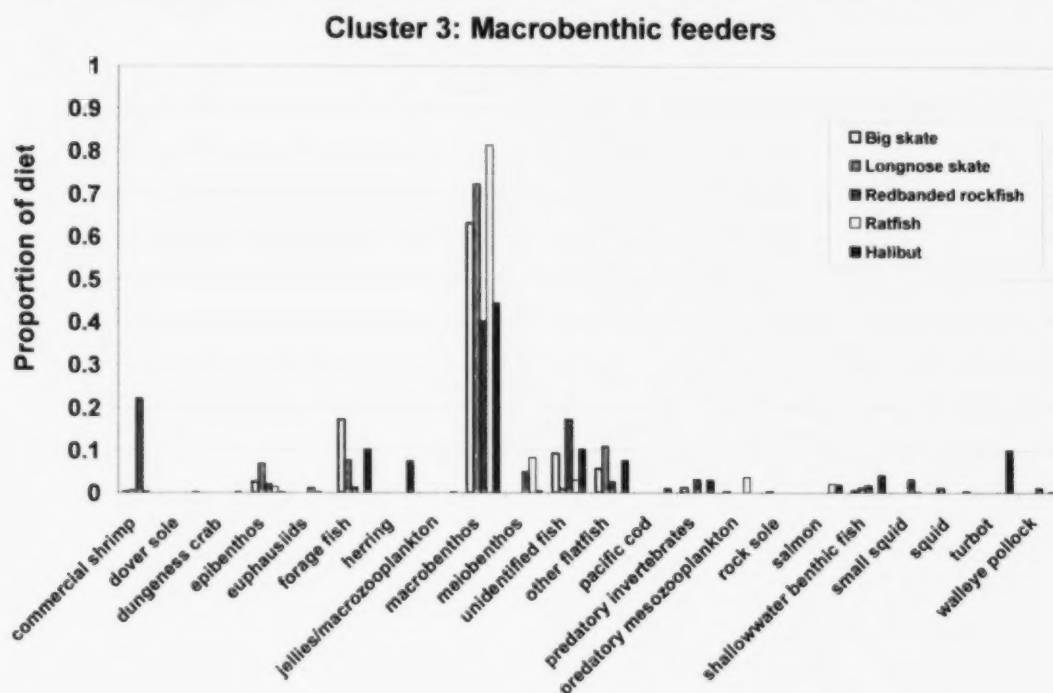


Fig. 14. Proportion of different diet groupings for the piscivores, 1985-1987.

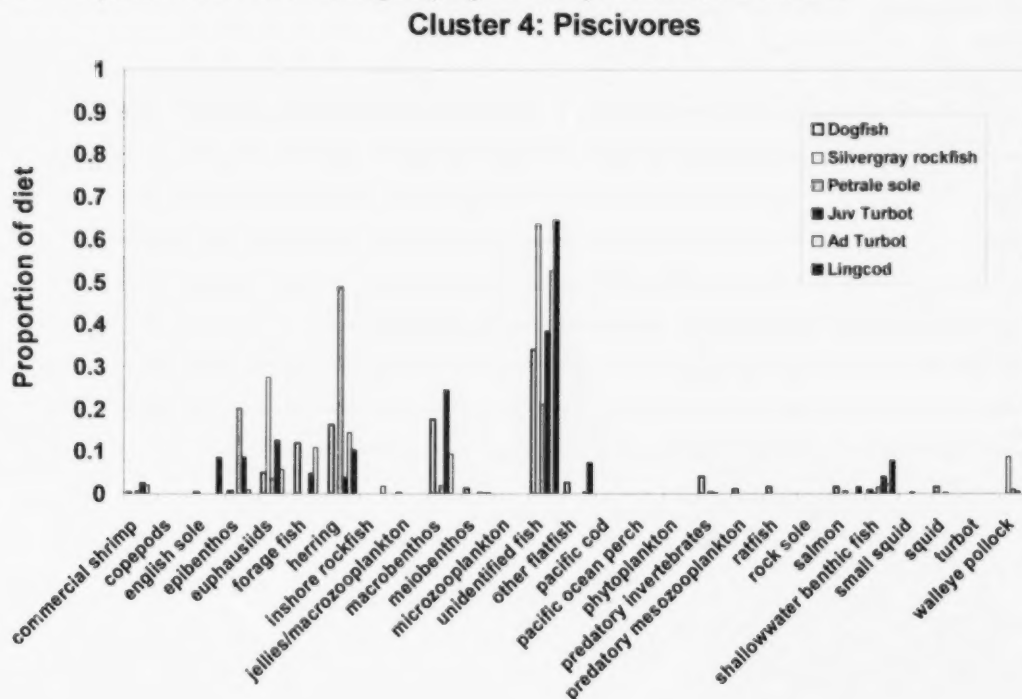




Fig. 15. Proportion of different diet groupings for the shrimp feeders, 1985-1987.

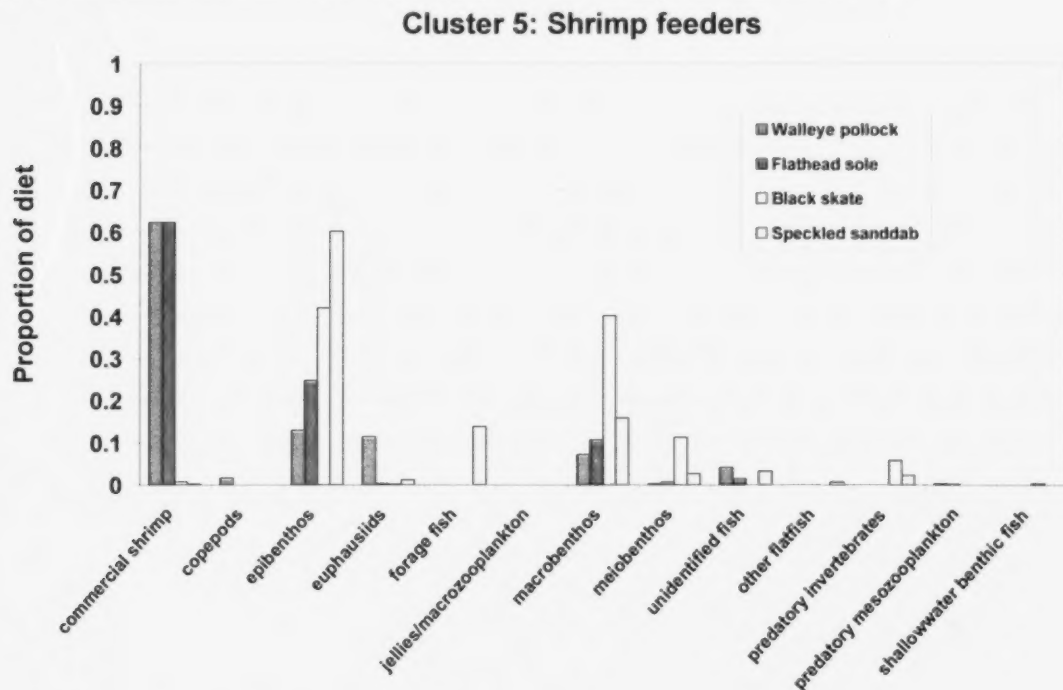


Fig. 16. Proportion of different diet groupings for the forage fish feeders, 1985-1987

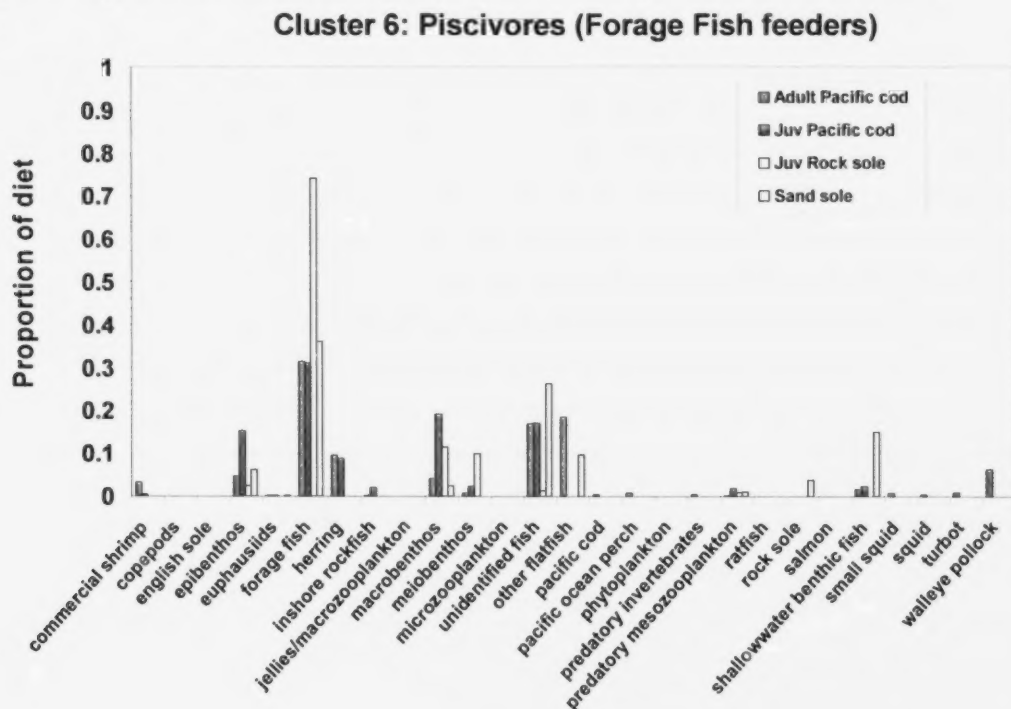


**Fig. 17.** Breakdown of macrobenthic and meiobenthic groupings in the diet of cluster 2, (annelid feeders) 1985-1987.

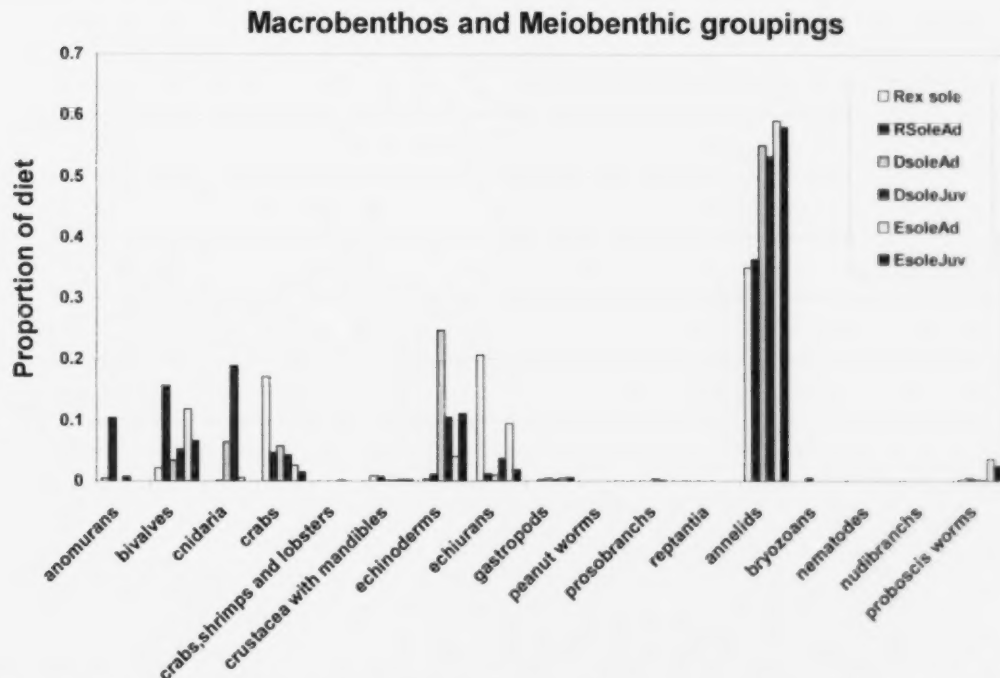


**Fig. 18.** Breakdown of macrobenthic and meiobenthic groupings in the diet of cluster 3, (crab feeders), 1985-1987.

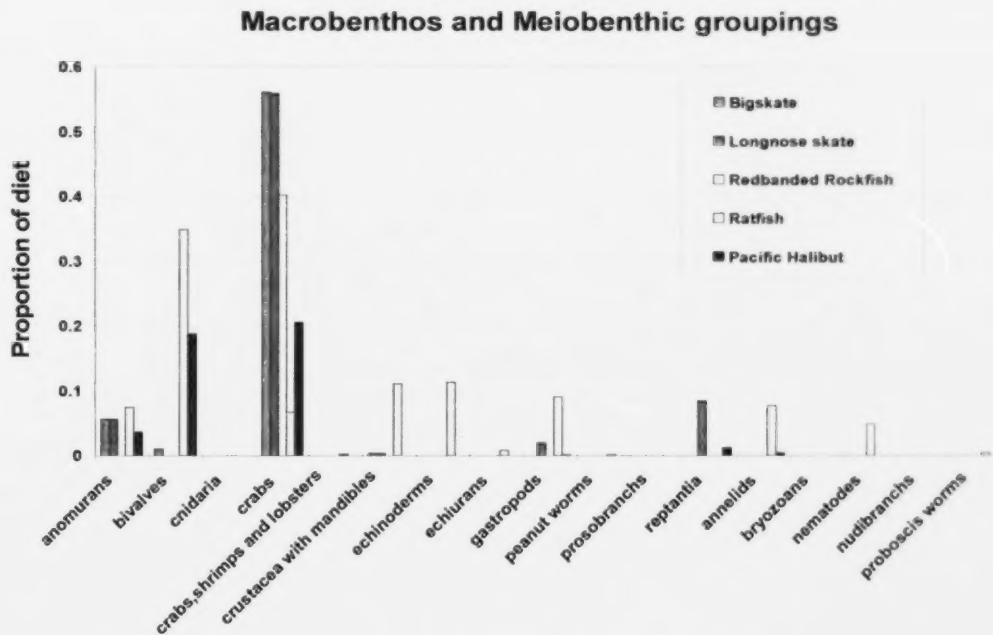


**Fig. 19.** Mean total prey weights by spatial area for all species taken from more than one spatial location 1985-1987 (data for all cruises pooled). In all cases, stomach weights are expressed for adults only, with the exception of sablefish (all juveniles) and dogfish (adult and juveniles).

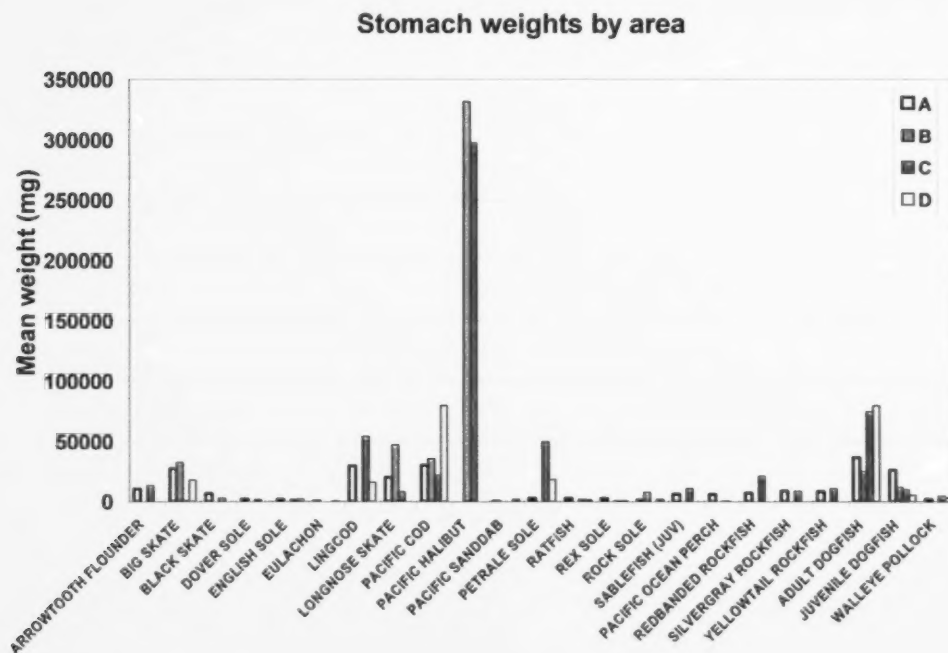


**Fig. 20.** Mean total prey weights by cruise for all species sampled in more than one cruise, 1985-1987, (data for all spatial areas pooled). In all cases, stomach weights are expressed for adults only, with the exception of sablefish (all juveniles) and dogfish (adult and juveniles).

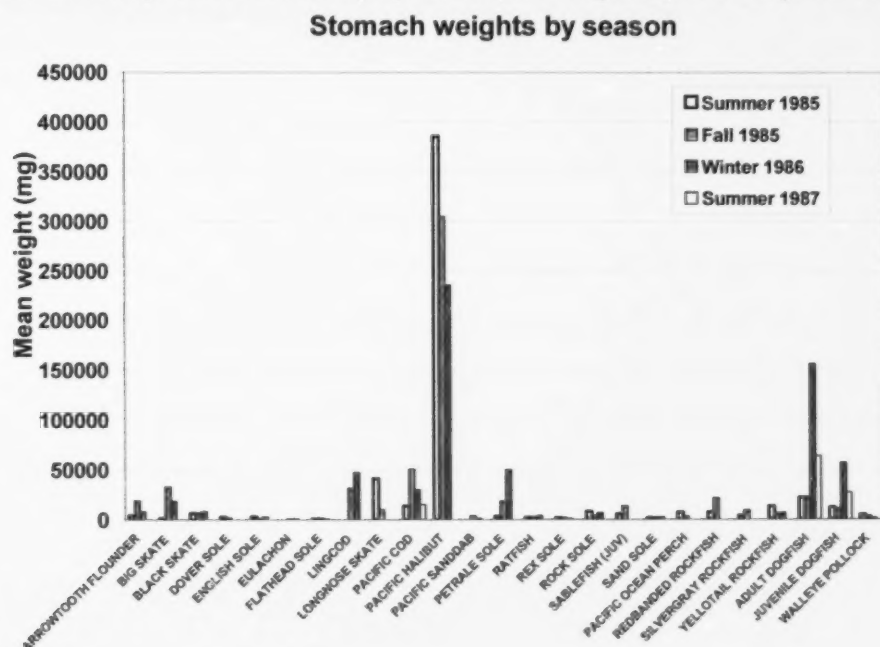


Fig. 21. Seasonal patterns in diet composition for arrowtooth flounder.

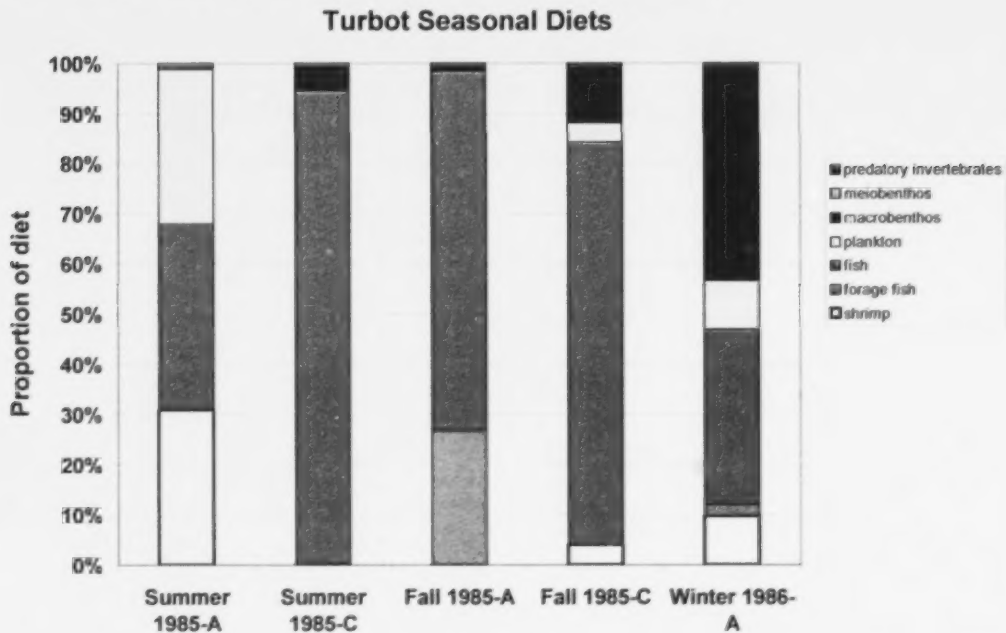


Fig. 22. Seasonal patterns in diet composition for dogfish.

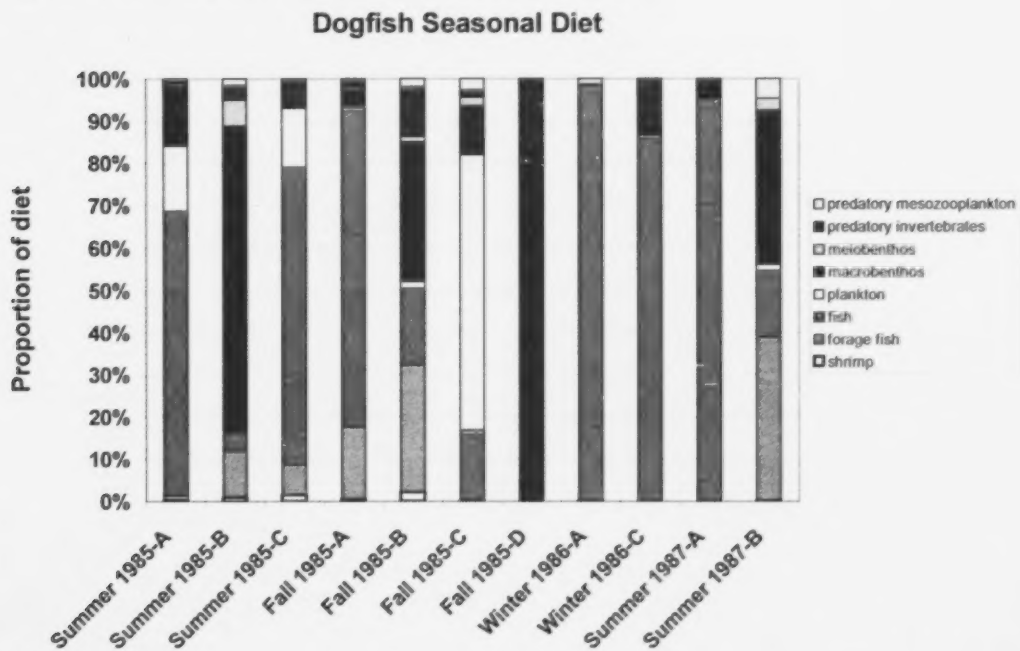


Fig. 23. Seasonal patterns in diet composition for ratfish.

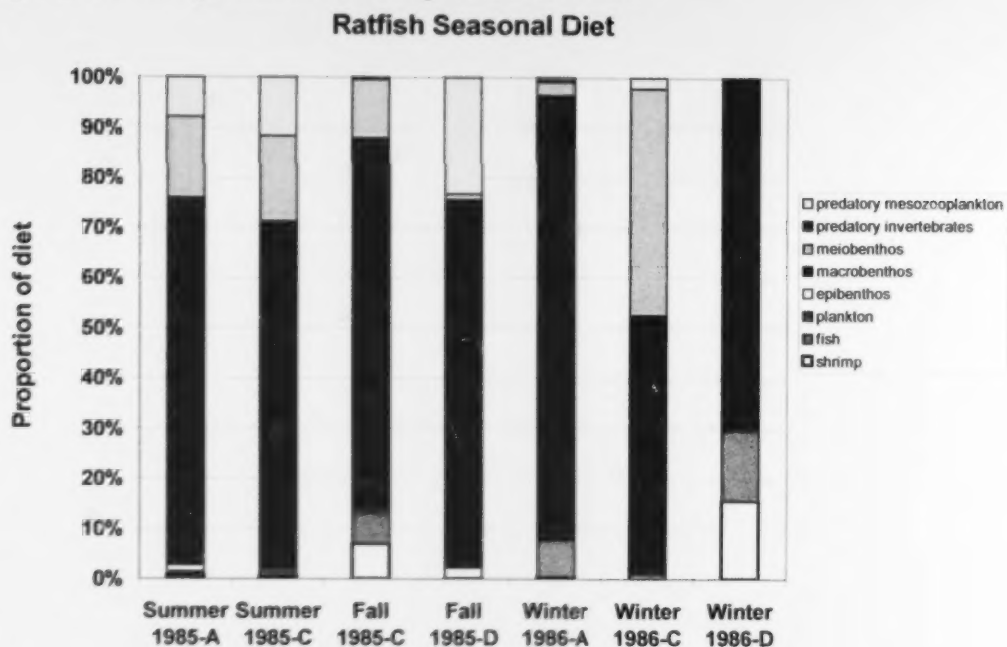




Fig. 24. Trophic structure of the Hecate Strait Ecosystem- Output from Ecopath modelling.

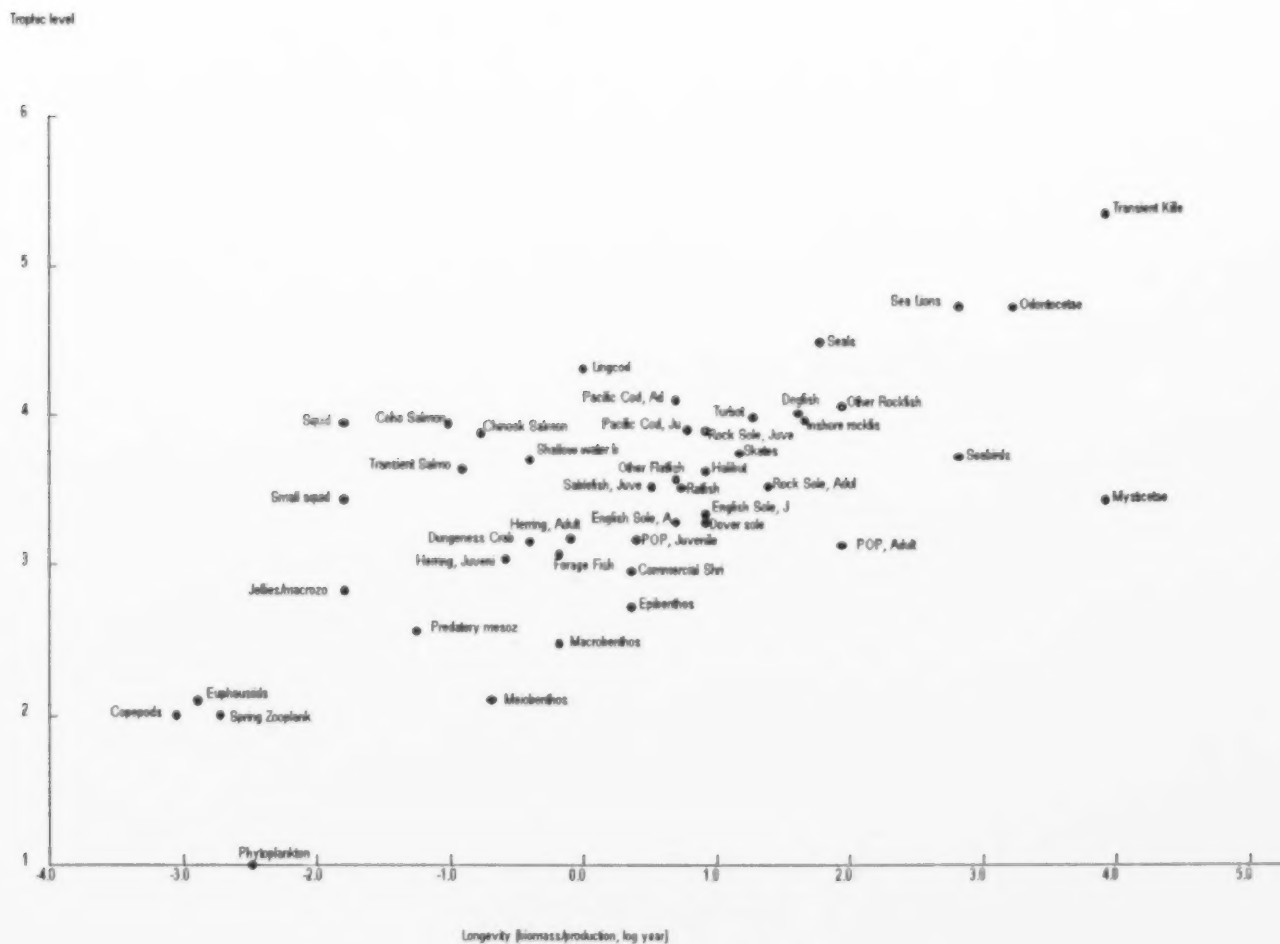


Fig. 25. Diagram of suggested impacts of the different groups in the Ecopath model on all other members of the ecosystem- output from Ecopath modelling.

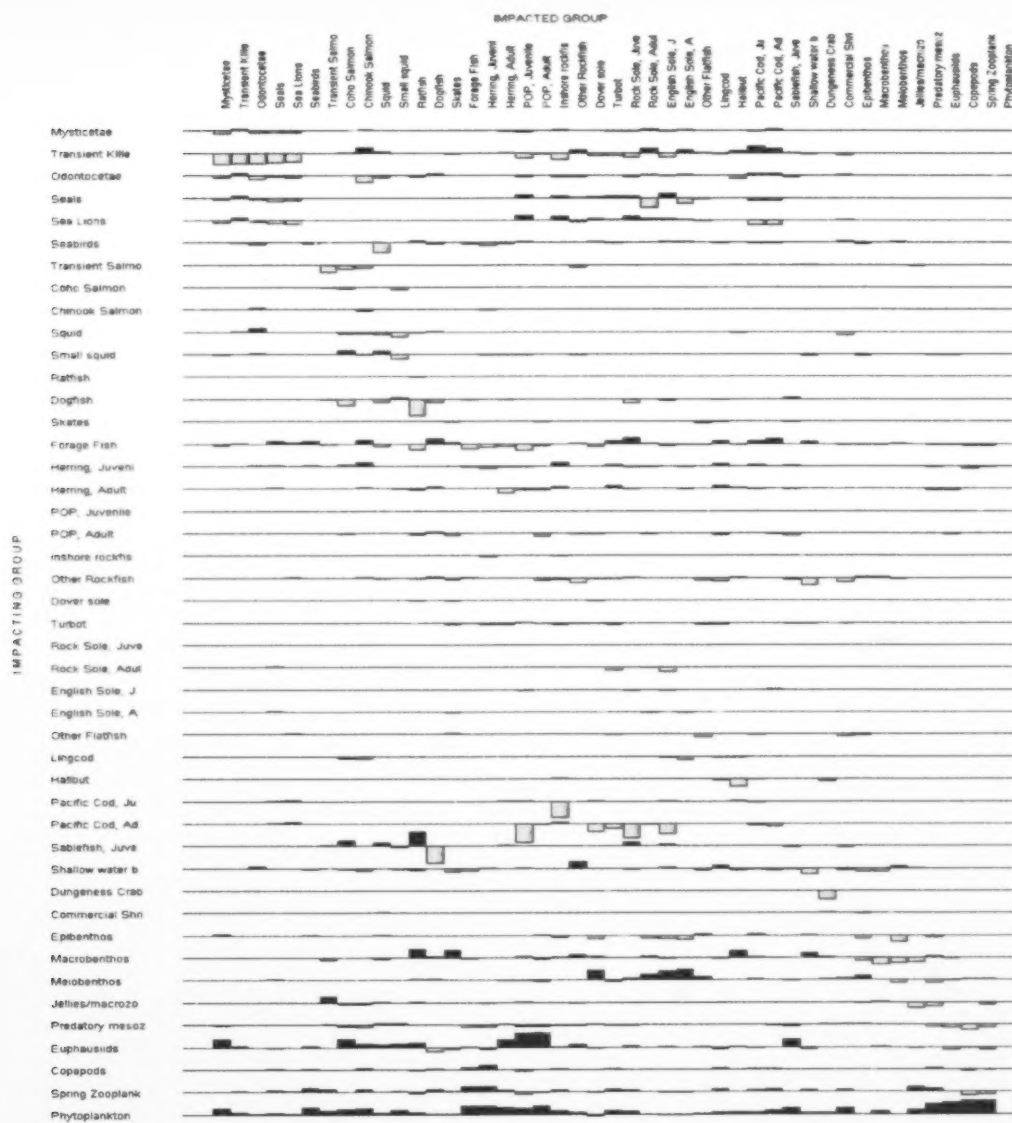
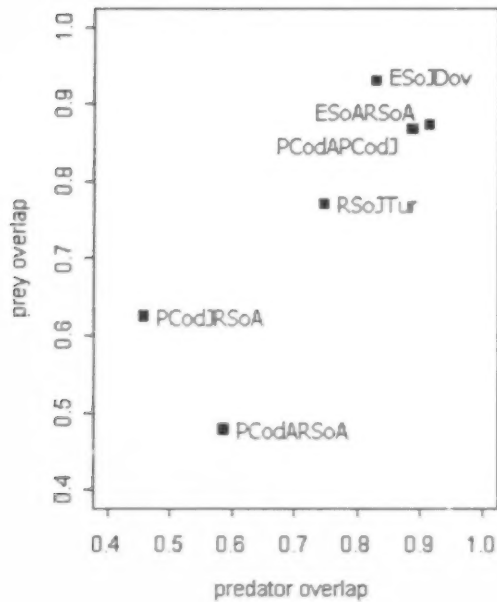


**Fig. 26.** Predator and prey overlap output from Ecopath model. Values plotted are for groundfish pairs with both prey and predator overlap values greater than 0.4.



**Legend:**

|        |                       |
|--------|-----------------------|
| PCodJ: | Juvenile Pacific cod  |
| PCodA: | Adult Pacific cod     |
| EsoJ:  | Juvenile English sole |
| EsoA:  | Adult English sole    |
| Dov:   | Dover sole            |
| RSoA:  | Adult rock sole       |
| RSoJ:  | Juvenile rock sole    |
| Tur:   | Arrowtooth flounder   |

**APPENDIX 1. DIET OF PREDATORS EXPRESSED AS ECOPATH GROUPS: DATA POOLED FOR 1985-1987, ALL HAULS.**

Nstom is the sample size of stomachs for each predator species. Avg is the proportion (sum of proportions =1).

| DIETS for all Cruises and Areas |                           |        |       |
|---------------------------------|---------------------------|--------|-------|
| <b>DOGFISH</b>                  |                           |        |       |
| PredID                          | Ecopath grouping          | AvgP   | nStom |
| 44                              | english sole              | 0.0022 | 756   |
| 44                              | epibenthos                | 0.0000 | 756   |
| 44                              | euphausiids               | 0.0499 | 756   |
| 44                              | forage fish               | 0.1185 | 756   |
| 44                              | herring                   | 0.1630 | 756   |
| 44                              | jellies/macrozooplankton  | 0.0019 | 756   |
| 44                              | macrobenthos              | 0.1753 | 756   |
| 44                              | meiobenthos               | 0.0122 | 756   |
| 44                              | other fish                | 0.3393 | 756   |
| 44                              | other flatfish            | 0.0258 | 756   |
| 44                              | phytoplankton             | 0.0001 | 756   |
| 44                              | predatory invertebrates   | 0.0390 | 756   |
| 44                              | predatory mesozooplankton | 0.0099 | 756   |
| 44                              | ratfish                   | 0.0160 | 756   |
| 44                              | rock sole                 | 0.0004 | 756   |
| 44                              | salmon                    | 0.0158 | 756   |
| 44                              | shallowwater benthic fish | 0.0075 | 756   |
| 44                              | shrimp                    | 0.0073 | 756   |
| 44                              | squid                     | 0.0157 | 756   |
| <b>BIG SKATE</b>                |                           |        |       |
| PredID                          | Ecopath grouping          | AvgP   | nStom |
| 56                              | forage fish               | 0.1706 | 134   |
| 56                              | jellies/macrozooplankton  | 0.0000 | 134   |
| 56                              | macrobenthos              | 0.6307 | 134   |
| 56                              | meiobenthos               | 0.0003 | 134   |
| 56                              | other fish                | 0.0918 | 134   |
| 56                              | other flatfish            | 0.0555 | 134   |
| 56                              | predatory invertebrates   | 0.0105 | 134   |
| 56                              | predatory mesozooplankton | 0.0010 | 134   |
| 56                              | rock sole                 | 0.0008 | 134   |
| 56                              | shallowwater benthic fish | 0.0040 | 134   |
| 56                              | shrimp                    | 0.0252 | 134   |

|                       |                           |             |              |
|-----------------------|---------------------------|-------------|--------------|
| 56                    | squid                     | 0.0095      | 134          |
| <b>BLACK SKATE</b>    |                           |             |              |
| PredID                | <b>Ecopath grouping</b>   | <b>AvgP</b> | <b>nStom</b> |
| 58                    | epibenthos                | 0.0330      | 32           |
| 58                    | euphausiids               | 0.0011      | 32           |
| 58                    | macrobenthos              | 0.4005      | 32           |
| 58                    | meiobenthos               | 0.1119      | 32           |
| 58                    | predatory mesozooplankton | 0.0577      | 32           |
| 58                    | shallowwater benthic fish | 0.0032      | 32           |
| 58                    | shrimp                    | 0.3925      | 32           |
| <b>LONGNOSE SKATE</b> |                           |             |              |
| PredID                | <b>Ecopath grouping</b>   | <b>AvgP</b> | <b>nStom</b> |
| 59                    | epibenthos                | 0.0000      | 30           |
| 59                    | forage fish               | 0.0766      | 30           |
| 59                    | macrobenthos              | 0.7212      | 30           |
| 59                    | other fish                | 0.0094      | 30           |
| 59                    | other flatfish            | 0.1079      | 30           |
| 59                    | shallowwater benthic fish | 0.0113      | 30           |
| 59                    | shrimp                    | 0.0736      | 30           |
| <b>RATFISH</b>        |                           |             |              |
| PredID                | <b>Ecopath grouping</b>   | <b>AvgP</b> | <b>nStom</b> |
| 66                    | epibenthos                | 0.0053      | 429          |
| 66                    | euphausiids               | 0.0018      | 429          |
| 66                    | jellies/macrozooplankton  | 0.0001      | 429          |
| 66                    | macrobenthos              | 0.8131      | 429          |
| 66                    | meiobenthos               | 0.0816      | 429          |
| 66                    | other fish                | 0.0297      | 429          |
| 66                    | predatory invertebrates   | 0.0006      | 429          |
| 66                    | predatory mesozooplankton | 0.0364      | 429          |
| 66                    | salmon                    | 0.0188      | 429          |
| 66                    | shallowwater benthic fish | 0.0004      | 429          |
| 66                    | shrimp                    | 0.0116      | 429          |
| 66                    | squid                     | 0.0008      | 429          |
| <b>EULACHON</b>       |                           |             |              |
| PredID                | <b>Ecopath grouping</b>   | <b>AvgP</b> | <b>nStom</b> |
| 148                   | euphausiids               | 0.5675      | 16           |
| 148                   | macrobenthos              | 0.4325      | 16           |

**PACIFIC COD**

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 222    | copepods                  | 0.0000 | 610   |
| 222    | epibenthos                | 0.0012 | 610   |
| 222    | euphausiids               | 0.0016 | 610   |
| 222    | forage fish               | 0.3127 | 610   |
| 222    | herring                   | 0.0932 | 610   |
| 222    | inshore rockfish          | 0.0035 | 610   |
| 222    | jellies/macrozooplankton  | 0.0000 | 610   |
| 222    | macrobenthos              | 0.0626 | 610   |
| 222    | meiobenthos               | 0.0091 | 610   |
| 222    | microzooplankton          | 0.0000 | 610   |
| 222    | other                     | 0.0001 | 610   |
| 222    | other fish                | 0.1687 | 610   |
| 222    | other flatfish            | 0.1567 | 610   |
| 222    | pacific cod               | 0.0033 | 610   |
| 222    | pacific ocean perch       | 0.0056 | 610   |
| 222    | predatory invertebrates   | 0.0040 | 610   |
| 222    | predatory mesozooplankton | 0.0039 | 610   |
| 222    | shallowwater benthic fish | 0.0159 | 610   |
| 222    | shrimp                    | 0.0871 | 610   |
| 222    | squid                     | 0.0097 | 610   |
| 222    | turbot                    | 0.0075 | 610   |
| 222    | walleye pollock           | 0.0533 | 610   |

**WALLEYE POLLOCK**

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 228    | copepods                  | 0.0160 | 207   |
| 228    | epibenthos                | 0.0862 | 207   |
| 228    | euphausiids               | 0.1143 | 207   |
| 228    | jellies/macrozooplankton  | 0.0001 | 207   |
| 228    | macrobenthos              | 0.0710 | 207   |
| 228    | meiobenthos               | 0.0032 | 207   |
| 228    | other fish                | 0.0400 | 207   |
| 228    | predatory invertebrates   | 0.0003 | 207   |
| 228    | predatory mesozooplankton | 0.0029 | 207   |
| 228    | shallowwater benthic fish | 0.0002 | 207   |
| 228    | shrimp                    | 0.6659 | 207   |

**PACIFIC OCEAN PERCH**

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 396    | copepods                  | 0.0257 | 112   |
| 396    | epibenthos                | 0.0069 | 112   |
| 396    | euphausiids               | 0.8595 | 112   |
| 396    | macrobenthos              | 0.0690 | 112   |
| 396    | other fish                | 0.0051 | 112   |
| 396    | predatory mesozooplankton | 0.0147 | 112   |
| 396    | shrimp                    | 0.0190 | 112   |

#### **SEBASTES BABCOCKI**

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 401    | euphausiids               | 0.0113 | 47    |
| 401    | forage fish               | 0.0121 | 47    |
| 401    | macrobenthos              | 0.4023 | 47    |
| 401    | meiobenthos               | 0.0480 | 47    |
| 401    | other fish                | 0.1721 | 47    |
| 401    | other flatfish            | 0.0248 | 47    |
| 401    | predatory invertebrates   | 0.0311 | 47    |
| 401    | predatory mesozooplankton | 0.0006 | 47    |
| 401    | shallowwater benthic fish | 0.0170 | 47    |
| 401    | shrimp                    | 0.2396 | 47    |
| 401    | squid                     | 0.0299 | 47    |
| 401    | walleye pollock           | 0.0111 | 47    |

#### **SEBASTES BREVISPINIS**

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 405    | euphausiids               | 0.2744 | 38    |
| 405    | jellies/macrozooplankton  | 0.0003 | 38    |
| 405    | macrobenthos              | 0.0019 | 38    |
| 405    | meiobenthos               | 0.0002 | 38    |
| 405    | other fish                | 0.6352 | 38    |
| 405    | predatory mesozooplankton | 0.0000 | 38    |
| 405    | shallowwater benthic fish | 0.0016 | 38    |
| 405    | walleye pollock           | 0.0862 | 38    |

#### **SEBASTES ELONGATUS**

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 414    | euphausiids               | 0.8223 | 4     |
| 414    | macrobenthos              | 0.1195 | 4     |
| 414    | other fish                | 0.0566 | 4     |
| 414    | predatory mesozooplankton | 0.0016 | 4     |



**SEBASTES FLAVIDUS**

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 418    | copepods                  | 0.0000 | 57    |
| 418    | epibenthos                | 0.0027 | 57    |
| 418    | euphausiids               | 0.5813 | 57    |
| 418    | forage fish               | 0.0134 | 57    |
| 418    | inshore rockfish          | 0.0075 | 57    |
| 418    | lingcod                   | 0.0003 | 57    |
| 418    | macrobenthos              | 0.1371 | 57    |
| 418    | meiobenthos               | 0.0008 | 57    |
| 418    | other fish                | 0.0189 | 57    |
| 418    | other flatfish            | 0.0002 | 57    |
| 418    | petrale sole              | 0.0025 | 57    |
| 418    | predatory invertebrates   | 0.0034 | 57    |
| 418    | predatory mesozooplankton | 0.0028 | 57    |
| 418    | shallowwater benthic fish | 0.0011 | 57    |
| 418    | shrimp                    | 0.2250 | 57    |
| 418    | squid                     | 0.0030 | 57    |

**SEBASTES PAUCISPINIS**

| PredID | Ecopath grouping | AvgP   | nStom |
|--------|------------------|--------|-------|
| 435    | meiobenthos      | 0.0009 | 8     |
| 435    | other fish       | 0.1255 | 8     |
| 435    | turbot           | 0.0228 | 8     |
| 435    | walleye pollock  | 0.8508 | 8     |

**SABLEFISH**

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 455    | dogfish                   | 0.0333 | 170   |
| 455    | epibenthos                | 0.0006 | 170   |
| 455    | euphausiids               | 0.5782 | 170   |
| 455    | forage fish               | 0.0199 | 170   |
| 455    | herring                   | 0.0288 | 170   |
| 455    | jellies/macrozooplankton  | 0.0000 | 170   |
| 455    | macrobenthos              | 0.1076 | 170   |
| 455    | meiobenthos               | 0.0104 | 170   |
| 455    | other fish                | 0.1623 | 170   |
| 455    | phytoplankton             | 0.0104 | 170   |
| 455    | predatory mesozooplankton | 0.0033 | 170   |
| 455    | shallowwater benthic fish | 0.0035 | 170   |

|                         |                           |        |       |
|-------------------------|---------------------------|--------|-------|
| 455                     | shrimp                    | 0.0385 | 170   |
| 455                     | squid                     | 0.0033 | 170   |
| <b>LINGCOD</b>          |                           |        |       |
| PredID                  | Ecopath grouping          | AvgP   | nStom |
| 467                     | english sole              | 0.0851 | 25    |
| 467                     | herring                   | 0.1030 | 25    |
| 467                     | meiobenthos               | 0.0009 | 25    |
| 467                     | other fish                | 0.6456 | 25    |
| 467                     | other flatfish            | 0.0721 | 25    |
| 467                     | salmon                    | 0.0162 | 25    |
| 467                     | shallowwater benthic fish | 0.0773 | 25    |
| <b>PACIFIC SANDDAB</b>  |                           |        |       |
| PredID                  | Ecopath grouping          | AvgP   | nStom |
| 596                     | copepods                  | 0.0002 | 90    |
| 596                     | epibenthos                | 0.3665 | 90    |
| 596                     | euphausiids               | 0.3852 | 90    |
| 596                     | jellies/macrozooplankton  | 0.0010 | 90    |
| 596                     | macrobenthos              | 0.1061 | 90    |
| 596                     | meiobenthos               | 0.0124 | 90    |
| 596                     | other fish                | 0.0326 | 90    |
| 596                     | other flatfish            | 0.0169 | 90    |
| 596                     | predatory mesozooplankton | 0.0114 | 90    |
| 596                     | shrimp                    | 0.0507 | 90    |
| 596                     | turbot                    | 0.0170 | 90    |
| <b>SPECKLED SANDDAB</b> |                           |        |       |
| PredID                  | Ecopath grouping          | AvgP   | nStom |
| 598                     | epibenthos                | 0.0486 | 88    |
| 598                     | euphausiids               | 0.0117 | 88    |
| 598                     | forage fish               | 0.1371 | 88    |
| 598                     | macrobenthos              | 0.1589 | 88    |
| 598                     | meiobenthos               | 0.0266 | 88    |
| 598                     | other fish                | 0.0328 | 88    |
| 598                     | other flatfish            | 0.0075 | 88    |
| 598                     | predatory mesozooplankton | 0.0226 | 88    |
| 598                     | shallowwater benthic fish | 0.0004 | 88    |
| 598                     | shrimp                    | 0.5540 | 88    |

**ARROWTOOTH FLOUNDER**

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 602    | epibenthos                | 0.0057 | 903   |
| 602    | euphausiids               | 0.0662 | 903   |
| 602    | forage fish               | 0.1001 | 903   |
| 602    | herring                   | 0.1289 | 903   |
| 602    | inshore rockfish          | 0.0150 | 903   |
| 602    | macrobenthos              | 0.1153 | 903   |
| 602    | meiobenthos               | 0.0014 | 903   |
| 602    | other fish                | 0.5053 | 903   |
| 602    | other flatfish            | 0.0028 | 903   |
| 602    | predatory invertebrates   | 0.0005 | 903   |
| 602    | predatory mesozooplankton | 0.0000 | 903   |
| 602    | shallowwater benthic fish | 0.0233 | 903   |
| 602    | shrimp                    | 0.0350 | 903   |
| 602    | walleye pollock           | 0.0006 | 903   |

**PETRALE SOLE**

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 607    | epibenthos                | 0.1936 | 104   |
| 607    | euphausiids               | 0.0355 | 104   |
| 607    | herring                   | 0.4879 | 104   |
| 607    | macrobenthos              | 0.0179 | 104   |
| 607    | meiobenthos               | 0.0002 | 104   |
| 607    | other fish                | 0.2113 | 104   |
| 607    | other flatfish            | 0.0002 | 104   |
| 607    | predatory invertebrates   | 0.0036 | 104   |
| 607    | predatory mesozooplankton | 0.0000 | 104   |
| 607    | salmon                    | 0.0060 | 104   |
| 607    | shallowwater benthic fish | 0.0138 | 104   |
| 607    | shrimp                    | 0.0155 | 104   |
| 607    | squid                     | 0.0044 | 104   |
| 607    | walleye pollock           | 0.0102 | 104   |

**REX SOLE**

| PredID | Ecopath grouping         | AvgP   | nStom |
|--------|--------------------------|--------|-------|
| 610    | copepods                 | 0.0000 | 563   |
| 610    | epibenthos               | 0.0027 | 563   |
| 610    | euphausiids              | 0.0056 | 563   |
| 610    | jellies/macrozooplankton | 0.0000 | 563   |
| 610    | macrobenthos             | 0.4125 | 563   |

|     |                           |        |     |
|-----|---------------------------|--------|-----|
| 610 | meiobenthos               | 0.3514 | 563 |
| 610 | microzooplankton          | 0.0000 | 563 |
| 610 | other fish                | 0.0005 | 563 |
| 610 | predatory mesozooplankton | 0.0212 | 563 |
| 610 | shallowwater benthic fish | 0.0002 | 563 |
| 610 | shrimp                    | 0.2058 | 563 |

#### FLATHEAD SOLE

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 612    | epibenthos                | 0.0441 | 96    |
| 612    | euphausiids               | 0.0029 | 96    |
| 612    | macrobenthos              | 0.1060 | 96    |
| 612    | meiobenthos               | 0.0071 | 96    |
| 612    | other fish                | 0.0135 | 96    |
| 612    | predatory mesozooplankton | 0.0010 | 96    |
| 612    | shrimp                    | 0.8255 | 96    |

#### PACIFIC HALIBUT

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 614    | Dover sole                | 0.0011 | 152   |
| 614    | dungeness crab            | 0.0011 | 152   |
| 614    | epibenthos                | 0.0009 | 152   |
| 614    | euphausiids               | 0.0000 | 152   |
| 614    | forage fish               | 0.1006 | 152   |
| 614    | herring                   | 0.0728 | 152   |
| 614    | jellies/macrozooplankton  | 0.0010 | 152   |
| 614    | macrobenthos              | 0.4430 | 152   |
| 614    | meiobenthos               | 0.0043 | 152   |
| 614    | other fish                | 0.1009 | 152   |
| 614    | other flatfish            | 0.0748 | 152   |
| 614    | pacific cod               | 0.0098 | 152   |
| 614    | predatory invertebrates   | 0.0289 | 152   |
| 614    | predatory mesozooplankton | 0.0000 | 152   |
| 614    | salmon                    | 0.0183 | 152   |
| 614    | shallowwater benthic fish | 0.0405 | 152   |
| 614    | shrimp                    | 0.0002 | 152   |
| 614    | squid                     | 0.0027 | 152   |
| 614    | turbot                    | 0.0982 | 152   |
| 614    | walleye pollock           | 0.0009 | 152   |

#### BUTTER SOLE

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 619    | epibenthos                | 0.0422 | 5     |
| 619    | forage fish               | 0.8351 | 5     |
| 619    | macrobenthos              | 0.0090 | 5     |
| 619    | meiobenthos               | 0.1086 | 5     |
| 619    | predatory mesozooplankton | 0.0051 | 5     |

#### ROCK SOLE

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 621    | english sole              | 0.0060 | 347   |
| 621    | epibenthos                | 0.0015 | 347   |
| 621    | euphausiids               | 0.0003 | 347   |
| 621    | forage fish               | 0.4055 | 347   |
| 621    | macrobenthos              | 0.2487 | 347   |
| 621    | meiobenthos               | 0.2612 | 347   |
| 621    | other fish                | 0.0454 | 347   |
| 621    | predatory mesozooplankton | 0.0109 | 347   |
| 621    | shallowwater benthic fish | 0.0032 | 347   |
| 621    | shrimp                    | 0.0127 | 347   |
| 621    | turbot                    | 0.0046 | 347   |

#### DOVER SOLE

| PredID | Ecopath grouping          | AvgP   | nStom |
|--------|---------------------------|--------|-------|
| 626    | copepods                  | 0.0000 | 294   |
| 626    | epibenthos                | 0.0021 | 294   |
| 626    | euphausiids               | 0.0009 | 294   |
| 626    | jellies/macrozooplankton  | 0.0000 | 294   |
| 626    | macrobenthos              | 0.4258 | 294   |
| 626    | meiobenthos               | 0.5441 | 294   |
| 626    | microzooplankton          | 0.0001 | 294   |
| 626    | other fish                | 0.0000 | 294   |
| 626    | predatory mesozooplankton | 0.0213 | 294   |
| 626    | shrimp                    | 0.0055 | 294   |

#### ENGLISH SOLE

| PredID | Ecopath grouping         | AvgP   | nStom |
|--------|--------------------------|--------|-------|
| 628    | epibenthos               | 0.0002 | 416   |
| 628    | euphausiids              | 0.0007 | 416   |
| 628    | forage fish              | 0.0818 | 416   |
| 628    | jellies/macrozooplankton | 0.0009 | 416   |
| 628    | macrobenthos             | 0.2654 | 416   |

|                        |                           |        |       |
|------------------------|---------------------------|--------|-------|
| 628                    | meiobenthos               | 0.6196 | 416   |
| 628                    | microzooplankton          | 0.0010 | 416   |
| 628                    | other fish                | 0.0006 | 416   |
| 628                    | other flatfish            | 0.0003 | 416   |
| 628                    | predatory mesozooplankton | 0.0227 | 416   |
| 628                    | shrimp                    | 0.0068 | 416   |
| <b>STARRY FLOUNDER</b> |                           |        |       |
| PredID                 | Ecopath grouping          | AvgP   | nStom |
| 631                    | macrobenthos              | 1.0000 | 3     |
| <b>CURLFIN SOLE</b>    |                           |        |       |
| PredID                 | Ecopath grouping          | AvgP   | nStom |
| 635                    | meiobenthos               | 1.0000 | 1     |
| <b>SAND SOLE</b>       |                           |        |       |
| PredID                 | Ecopath grouping          | AvgP   | nStom |
| 636                    | epibenthos                | 0.0021 | 199   |
| 636                    | euphausiids               | 0.0015 | 199   |
| 636                    | forage fish               | 0.3604 | 199   |
| 636                    | macrobenthos              | 0.0236 | 199   |
| 636                    | meiobenthos               | 0.0003 | 199   |
| 636                    | other fish                | 0.2613 | 199   |
| 636                    | other flatfish            | 0.0956 | 199   |
| 636                    | predatory mesozooplankton | 0.0097 | 199   |
| 636                    | rock sole                 | 0.0377 | 199   |
| 636                    | shallowwater benthic fish | 0.1491 | 199   |
| 636                    | shrimp                    | 0.0587 | 199   |

**APPENDIX 2. DIET FOR PREDATORS EXPRESSED AS ECOPATH SUB GROUPINGS: ALL AREAS AND CRUISES COMBINED.**

Nstom is the sample size of stomachs for each predator species, AvgP is the proportion (sum=1).

| Predator Diet-all cruises and areas combined- by Ecopath Subgroups |                           |                          |        |       |
|--------------------------------------------------------------------|---------------------------|--------------------------|--------|-------|
| <b>DOGFISH</b>                                                     |                           |                          |        |       |
| PredID                                                             | Ecopath grouping          | Ecopath Sub Group        | AvgP   | nStom |
| 44                                                                 | english sole              | english sole             | 0.0022 | 756   |
| 44                                                                 | epibenthos                | barnacles                | 0.0000 | 756   |
| 44                                                                 | euphausiids               | euphausiids              | 0.0499 | 756   |
| 44                                                                 | forage fish               | sandlance                | 0.1185 | 756   |
| 44                                                                 | herring                   | herring                  | 0.1630 | 756   |
| 44                                                                 | jellies/macrozooplankton  | medusae                  | 0.0019 | 756   |
| 44                                                                 | macrobenthos              | anomurans                | 0.0426 | 756   |
| 44                                                                 | macrobenthos              | ascidians                | 0.0002 | 756   |
| 44                                                                 | macrobenthos              | bivalves                 | 0.0466 | 756   |
| 44                                                                 | macrobenthos              | branchiopods             | 0.0003 | 756   |
| 44                                                                 | macrobenthos              | cnidaria                 | 0.0006 | 756   |
| 44                                                                 | macrobenthos              | crabs                    | 0.0528 | 756   |
| 44                                                                 | macrobenthos              | crabs,shrimpsand         |        |       |
| 44                                                                 | macrobenthos              | lobsters                 | 0.0046 | 756   |
| 44                                                                 | macrobenthos              | crustacea with mandibles | 0.0027 | 756   |
| 44                                                                 | macrobenthos              | Echinoderms              | 0.0000 | 756   |
| 44                                                                 | macrobenthos              | Echiurans                | 0.0017 | 756   |
| 44                                                                 | macrobenthos              | Gastropods               | 0.0199 | 756   |
| 44                                                                 | macrobenthos              | Lophophorans             | 0.0001 | 756   |
| 44                                                                 | macrobenthos              | Molluscs                 | 0.0033 | 756   |
| 44                                                                 | macrobenthos              | polyplacophora           | 0.0000 | 756   |
| 44                                                                 | macrobenthos              | Reptantia                | 0.0001 | 756   |
| 44                                                                 | meiobenthos               | Annelids                 | 0.0115 | 756   |
| 44                                                                 | meiobenthos               | Nematodes                | 0.0004 | 756   |
| 44                                                                 | meiobenthos               | proboscis worms          | 0.0004 | 756   |
| 44                                                                 | other fish                | bony fishes              | 0.2779 | 756   |
| 44                                                                 | other fish                | unid fish                | 0.0615 | 756   |
| 44                                                                 | other flatfish            | Dabs                     | 0.0100 | 756   |
| 44                                                                 | other flatfish            | Flatfishes               | 0.0154 | 756   |
| 44                                                                 | other flatfish            | flathead sole            | 0.0004 | 756   |
| 44                                                                 | phytoplankton             | Phytoplankton            | 0.0001 | 756   |
| 44                                                                 | predatory invertebrates   | Cephalopods              | 0.0063 | 756   |
| 44                                                                 | predatory invertebrates   | Octopus                  | 0.0327 | 756   |
| 44                                                                 | predatory mesozooplankton | Amphipods                | 0.0000 | 756   |



|    |                           |                   |        |     |
|----|---------------------------|-------------------|--------|-----|
| 44 | predatory mesozooplankton | Decapods          | 0.0099 | 756 |
| 44 | predatory mesozooplankton | Gammarids         | 0.0000 | 756 |
| 44 | predatory mesozooplankton | hyperid amphipods | 0.0000 | 756 |
| 44 | ratfish                   | Ratfish           | 0.0160 | 756 |
| 44 | rock sole                 | rock sole         | 0.0004 | 756 |
| 44 | salmon                    | Salmon            | 0.0158 | 756 |
| 44 | shallowwater benthic fish | Agonidae          | 0.0008 | 756 |
| 44 | shallowwater benthic fish | Lumpfishes        | 0.0003 | 756 |
| 44 | shallowwater benthic fish | pacific tomcod    | 0.0005 | 756 |
| 44 | shallowwater benthic fish | Perch             | 0.0008 | 756 |
| 44 | shallowwater benthic fish | Sculpins          | 0.0049 | 756 |
| 44 | shallowwater benthic fish | Snailfishes       | 0.0002 | 756 |
| 44 | shrimp                    | Shrimp            | 0.0073 | 756 |
| 44 | squid                     | Squid             | 0.0157 | 756 |

#### **BIG SKATE**

| PredID | Ecopath grouping          | Ecopath Sub Group        | AvgP   | nStom |
|--------|---------------------------|--------------------------|--------|-------|
| 56     | forage fish               | Sandlance                | 0.1706 | 134   |
| 56     | jellies/macrozooplankton  | medusae                  | 0.0000 | 134   |
| 56     | macrobenthos              | anomurans                | 0.0561 | 134   |
| 56     | macrobenthos              | bivalves                 | 0.0102 | 134   |
| 56     | macrobenthos              | crabs                    | 0.5610 | 134   |
| 56     | macrobenthos              | crustacea with mandibles | 0.0030 | 134   |
| 56     | macrobenthos              | gastropods               | 0.0004 | 134   |
| 56     | meiobenthos               | annelids                 | 0.0001 | 134   |
| 56     | meiobenthos               | nematodes                | 0.0002 | 134   |
| 56     | other fish                | bony fishes              | 0.0831 | 134   |
| 56     | other fish                | unid fish                | 0.0087 | 134   |
| 56     | other flatfish            | dabs                     | 0.0258 | 134   |
| 56     | other flatfish            | flatfishes               | 0.0181 | 134   |
| 56     | other flatfish            | sand sole                | 0.0116 | 134   |
| 56     | predatory invertebrates   | octopus                  | 0.0105 | 134   |
| 56     | predatory mesozooplankton | cumaceans                | 0.0000 | 134   |
| 56     | predatory mesozooplankton | decapods                 | 0.0009 | 134   |
| 56     | predatory mesozooplankton | gammarids                | 0.0001 | 134   |
| 56     | rock sole                 | rock sole                | 0.0008 | 134   |
| 56     | shallowwater benthic fish | sandfishes               | 0.0040 | 134   |
| 56     | shrimp                    | shrimp                   | 0.0252 | 134   |
| 56     | squid                     | squid                    | 0.0095 | 134   |

#### **BLACK SKATE**

| PredID | Ecopath grouping | Ecopath Sub Group | AvgP | nStom |
|--------|------------------|-------------------|------|-------|
|--------|------------------|-------------------|------|-------|

|    |                           |                          |        |    |
|----|---------------------------|--------------------------|--------|----|
| 58 | epibenthos                | isopods                  | 0.0270 | 32 |
| 58 | epibenthos                | mysids                   | 0.0061 | 32 |
| 58 | euphausiids               | euphausiids              | 0.0011 | 32 |
| 58 | macrobenthos              | anomurans                | 0.1406 | 32 |
| 58 | macrobenthos              | crabs                    | 0.1931 | 32 |
| 58 | macrobenthos              | crustacea with mandibles | 0.0668 | 32 |
| 58 | meiobenthos               | annelids                 | 0.1119 | 32 |
| 58 | predatory mesozooplankton | cumaceans                | 0.0047 | 32 |
| 58 | predatory mesozooplankton | gammarids                | 0.0530 | 32 |
| 58 | shallowwater benthic fish | agonidae                 | 0.0026 | 32 |
| 58 | shallowwater benthic fish | pricklebacks             | 0.0006 | 32 |
| 58 | shrimp                    | shrimp                   | 0.3925 | 32 |

#### LONGNOSE SKATE

| PredID | Ecopath grouping          | Ecopath Sub Group        | AvgP   | nStom |
|--------|---------------------------|--------------------------|--------|-------|
| 59     | epibenthos                | mysids                   | 0.0000 | 30    |
| 59     | forage fish               | sandlance                | 0.0766 | 30    |
| 59     | macrobenthos              | anomurans                | 0.0555 | 30    |
| 59     | macrobenthos              | bivalves                 | 0.0004 | 30    |
| 59     | macrobenthos              | crabs                    | 0.5589 | 30    |
| 59     | macrobenthos              | crustacea with mandibles | 0.0029 | 30    |
| 59     | macrobenthos              | gastropods               | 0.0193 | 30    |
| 59     | macrobenthos              | reptantia                | 0.0843 | 30    |
| 59     | other fish                | unid fish                | 0.0094 | 30    |
| 59     | other flatfish            | flatfishes               | 0.1079 | 30    |
| 59     | shallowwater benthic fish | sculpins                 | 0.0113 | 30    |
| 59     | shrimp                    | shrimp                   | 0.0736 | 30    |

#### RATFISH

| PredID | Ecopath grouping         | Ecopath Sub Group          | AvgP   | nStom |
|--------|--------------------------|----------------------------|--------|-------|
| 66     | epibenthos               | barnacles                  | 0.0005 | 429   |
| 66     | epibenthos               | isopods                    | 0.0040 | 429   |
| 66     | epibenthos               | mysids                     | 0.0008 | 429   |
| 66     | euphausiids              | euphausiids                | 0.0018 | 429   |
| 66     | jellies/macrozooplankton | medusae                    | 0.0001 | 429   |
| 66     | macrobenthos             | anomurans                  | 0.0738 | 429   |
| 66     | macrobenthos             | bivalves                   | 0.3484 | 429   |
| 66     | macrobenthos             | crabs                      | 0.0676 | 429   |
| 66     | macrobenthos             | crabs,shrimps and lobsters | 0.0013 | 429   |
| 66     | macrobenthos             | crustacea with mandibles   | 0.1108 | 429   |
| 66     | macrobenthos             | echinoderms                | 0.1130 | 429   |

|    |                           |                 |        |     |
|----|---------------------------|-----------------|--------|-----|
| 66 | macrobenthos              | echiurans       | 0.0070 | 429 |
| 66 | macrobenthos              | gastropods      | 0.0904 | 429 |
| 66 | macrobenthos              | peanut worms    | 0.0008 | 429 |
| 66 | meiobenthos               | annelids        | 0.0770 | 429 |
| 66 | meiobenthos               | nudibranchs     | 0.0001 | 429 |
| 66 | meiobenthos               | proboscis worms | 0.0045 | 429 |
| 66 | other fish                | bony fishes     | 0.0242 | 429 |
| 66 | other fish                | teleosts        | 0.0002 | 429 |
| 66 | other fish                | unid fish       | 0.0053 | 429 |
| 66 | predatory invertebrates   | cephalopods     | 0.0006 | 429 |
| 66 | predatory mesozooplankton | amphipods       | 0.0072 | 429 |
| 66 | predatory mesozooplankton | cumaceans       | 0.0001 | 429 |
| 66 | predatory mesozooplankton | decapods        | 0.0185 | 429 |
| 66 | predatory mesozooplankton | gammarids       | 0.0105 | 429 |
| 66 | predatory mesozooplankton | ostracods       | 0.0000 | 429 |
| 66 | salmon                    | salmon          | 0.0188 | 429 |
| 66 | shallowwater benthic fish | agonidae        | 0.0004 | 429 |
| 66 | shrimp                    | shrimp          | 0.0116 | 429 |
| 66 | squid                     | squid           | 0.0008 | 429 |

#### EULACHON

| PredID | Ecopath grouping | Ecopath Sub Group        | AvgP   | nStom |
|--------|------------------|--------------------------|--------|-------|
| 148    | euphausiids      | euphausiids              | 0.5675 | 16    |
| 148    | macrobenthos     | crustacea with mandibles | 0.4325 | 16    |

#### PACIFIC COD

| PredID | Ecopath grouping         | Ecopath Sub Group          | AvgP   | nStom |
|--------|--------------------------|----------------------------|--------|-------|
| 222    | copepods                 | copepods                   | 0.0000 | 610   |
| 222    | epibenthos               | barnacles                  | 0.0001 | 610   |
| 222    | epibenthos               | isopods                    | 0.0000 | 610   |
| 222    | epibenthos               | mysids                     | 0.0011 | 610   |
| 222    | euphausiids              | euphausiids                | 0.0016 | 610   |
| 222    | forage fish              | sandlance                  | 0.3127 | 610   |
| 222    | herring                  | herring                    | 0.0932 | 610   |
| 222    | inshore rockfish         | rockfish                   | 0.0035 | 610   |
| 222    | jellies/macrozooplankton | medusae                    | 0.0000 | 610   |
| 222    | macrobenthos             | anomurans                  | 0.0079 | 610   |
| 222    | macrobenthos             | bivalves                   | 0.0012 | 610   |
| 222    | macrobenthos             | cnidaria                   | 0.0000 | 610   |
| 222    | macrobenthos             | crabs                      | 0.0257 | 610   |
| 222    | macrobenthos             | crabs,shrimps and lobsters | 0.0025 | 610   |

|     |                           |                          |        |     |
|-----|---------------------------|--------------------------|--------|-----|
| 222 | macrobenthos              | crustacea                | 0.0000 | 610 |
| 222 | macrobenthos              | crustacea with mandibles | 0.0149 | 610 |
| 222 | macrobenthos              | echinoderms              | 0.0000 | 610 |
| 222 | macrobenthos              | echiurans                | 0.0027 | 610 |
| 222 | macrobenthos              | gastropods               | 0.0072 | 610 |
| 222 | macrobenthos              | molluscs                 | 0.0000 | 610 |
| 222 | macrobenthos              | peanut worms             | 0.0000 | 610 |
| 222 | macrobenthos              | sponges                  | 0.0004 | 610 |
| 222 | meiobenthos               | annelids                 | 0.0077 | 610 |
| 222 | meiobenthos               | nematodes                | 0.0014 | 610 |
| 222 | meiobenthos               | proboscis worms          | 0.0000 | 610 |
| 222 | microzooplankton          | protozoa                 | 0.0000 | 610 |
| 222 | other                     | tussock moths            | 0.0001 | 610 |
| 222 | other fish                | bony fishes              | 0.0721 | 610 |
| 222 | other fish                | teleosts                 | 0.0000 | 610 |
| 222 | other fish                | unid fish                | 0.0966 | 610 |
| 222 | other flatfish            | dabs                     | 0.0066 | 610 |
| 222 | other flatfish            | flatfishes               | 0.1501 | 610 |
| 222 | pacific cod               | pacific cod              | 0.0033 | 610 |
| 222 | pacific ocean perch       | pacific ocean perch      | 0.0056 | 610 |
| 222 | predatory invertebrates   | cephalopods              | 0.0040 | 610 |
| 222 | predatory mesozooplankton | amphipods                | 0.0005 | 610 |
| 222 | predatory mesozooplankton | cumaceans                | 0.0000 | 610 |
| 222 | predatory mesozooplankton | decapods                 | 0.0009 | 610 |
| 222 | predatory mesozooplankton | gammarids                | 0.0025 | 610 |
| 222 | shallowwater benthic fish | agonidae                 | 0.0049 | 610 |
| 222 | shallowwater benthic fish | greenling                | 0.0064 | 610 |
| 222 | shallowwater benthic fish | perch                    | 0.0015 | 610 |
| 222 | shallowwater benthic fish | pholididae               | 0.0021 | 610 |
| 222 | shallowwater benthic fish | pricklebacks             | 0.0003 | 610 |
| 222 | shallowwater benthic fish | sculpins                 | 0.0006 | 610 |
| 222 | shrimp                    | shrimp                   | 0.0871 | 610 |
| 222 | squid                     | squid                    | 0.0097 | 610 |
| 222 | turbot                    | turbot                   | 0.0075 | 610 |
| 222 | walleye pollock           | walleye pollock          | 0.0533 | 610 |

#### WALLEYE POLLOCK

| PredID | Ecopath grouping | Ecopath Sub Group | AvgP   | nStom |
|--------|------------------|-------------------|--------|-------|
| 228    | copepods         | copepods          | 0.0160 | 207   |
| 228    | epibenthos       | isopods           | 0.0006 | 207   |
| 228    | epibenthos       | mysids            | 0.0857 | 207   |
| 228    | euphausiids      | euphausiids       | 0.1143 | 207   |

|     |                           |                          |        |     |
|-----|---------------------------|--------------------------|--------|-----|
| 228 | jellies/macrozooplankton  | tunicates                | 0.0001 | 207 |
| 228 | macrobenthos              | anomurans                | 0.0002 | 207 |
| 228 | macrobenthos              | bivalves                 | 0.0000 | 207 |
| 228 | macrobenthos              | chaetognaths             | 0.0000 | 207 |
| 228 | macrobenthos              | crabs                    | 0.0170 | 207 |
| 228 | macrobenthos              | crustacea with mandibles | 0.0466 | 207 |
| 228 | macrobenthos              | gastropods               | 0.0071 | 207 |
| 228 | meiobenthos               | annelids                 | 0.0026 | 207 |
| 228 | meiobenthos               | nematodes                | 0.0006 | 207 |
| 228 | other fish                | bony fishes              | 0.0173 | 207 |
| 228 | other fish                | unid fish                | 0.0227 | 207 |
| 228 | predatory invertebrates   | cephalopods              | 0.0003 | 207 |
| 228 | predatory mesozooplankton | amphipods                | 0.0000 | 207 |
| 228 | predatory mesozooplankton | cumaceans                | 0.0002 | 207 |
| 228 | predatory mesozooplankton | gammarids                | 0.0025 | 207 |
| 228 | predatory mesozooplankton | hyperid amphipods        | 0.0001 | 207 |
| 228 | shallowwater benthic fish | sculpins                 | 0.0002 | 207 |
| 228 | shrimp                    | shrimp                   | 0.6659 | 207 |

#### SEBASTES ALUTUS -PACIFIC OCEAN PERCH

| PredID | Ecopath grouping          | Ecopath Sub Group        | AvgP   | nStom |
|--------|---------------------------|--------------------------|--------|-------|
| 396    | copepods                  | copepods                 | 0.0257 | 112   |
| 396    | epibenthos                | mysids                   | 0.0069 | 112   |
| 396    | euphausiids               | euphausiids              | 0.8595 | 112   |
| 396    | macrobenthos              | chaetognaths             | 0.0006 | 112   |
| 396    | macrobenthos              | crabs                    | 0.0468 | 112   |
| 396    | macrobenthos              | crustacea with mandibles | 0.0139 | 112   |
| 396    | macrobenthos              | gastropods               | 0.0077 | 112   |
| 396    | other fish                | unid fish                | 0.0051 | 112   |
| 396    | predatory mesozooplankton | amphipods                | 0.0007 | 112   |
| 396    | predatory mesozooplankton | cumaceans                | 0.0014 | 112   |
| 396    | predatory mesozooplankton | gammarids                | 0.0117 | 112   |
| 396    | predatory mesozooplankton | hyperid amphipods        | 0.0008 | 112   |
| 396    | predatory mesozooplankton | megalops                 | 0.0003 | 112   |
| 396    | shrimp                    | shrimp                   | 0.0190 | 112   |

#### SEBASTES BABCOCKI

| PredID | Ecopath grouping | Ecopath Sub Group | AvgP   | nStom |
|--------|------------------|-------------------|--------|-------|
| 401    | euphausiids      | euphausiids       | 0.0113 | 47    |
| 401    | forage fish      | sandlance         | 0.0121 | 47    |
| 401    | macrobenthos     | crabs             | 0.4023 | 47    |
| 401    | meiobenthos      | nematodes         | 0.0480 | 47    |

|     |                           |                 |        |    |
|-----|---------------------------|-----------------|--------|----|
| 401 | other fish                | bony fishes     | 0.1721 | 47 |
| 401 | other flatfish            | dabs            | 0.0201 | 47 |
| 401 | other flatfish            | slender sole    | 0.0047 | 47 |
| 401 | predatory invertebrates   | cephalopods     | 0.0311 | 47 |
| 401 | predatory mesozooplankton | amphipods       | 0.0004 | 47 |
| 401 | predatory mesozooplankton | gammarids       | 0.0003 | 47 |
| 401 | shallowwater benthic fish | agonidae        | 0.0056 | 47 |
| 401 | shallowwater benthic fish | pricklebacks    | 0.0114 | 47 |
| 401 | shrimp                    | shrimp          | 0.2396 | 47 |
| 401 | squid                     | squid           | 0.0299 | 47 |
| 401 | walleye pollock           | walleye pollock | 0.0111 | 47 |

#### SEBASTES BREVISPINIS

| PredID | Ecopath grouping          | Ecopath Sub Group        | AvgP   | nStom |
|--------|---------------------------|--------------------------|--------|-------|
| 405    | euphausiids               | euphausiids              | 0.2744 | 38    |
| 405    | jellies/macrozooplankton  | medusae                  | 0.0003 | 38    |
| 405    | macrobenthos              | crustacea with mandibles | 0.0019 | 38    |
| 405    | meiobenthos               | nematodes                | 0.0002 | 38    |
| 405    | other fish                | bony fishes              | 0.2084 | 38    |
| 405    | other fish                | unid fish                | 0.4268 | 38    |
| 405    | predatory mesozooplankton | hyperid amphipods        | 0.0000 | 38    |
| 405    | shallowwater benthic fish | smelt                    | 0.0016 | 38    |
| 405    | walleye pollock           | walleye pollock          | 0.0862 | 38    |

#### SEBASTES ELONGATUS

| PredID | Ecopath grouping          | Ecopath Sub Group        | AvgP   | nStom |
|--------|---------------------------|--------------------------|--------|-------|
| 414    | euphausiids               | euphausiids              | 0.8223 | 4     |
| 414    | macrobenthos              | crabs                    | 0.1115 | 4     |
| 414    | macrobenthos              | crustacea with mandibles | 0.0080 | 4     |
| 414    | other fish                | bony fishes              | 0.0566 | 4     |
| 414    | predatory mesozooplankton | amphipods                | 0.0005 | 4     |
| 414    | predatory mesozooplankton | gammarids                | 0.0010 | 4     |

#### SEBASTES FLAVIDUS

| PredID | Ecopath grouping | Ecopath Sub Group | AvgP   | nStom |
|--------|------------------|-------------------|--------|-------|
| 418    | copepods         | copepods          | 0.0000 | 57    |
| 418    | epibenthos       | mysids            | 0.0027 | 57    |
| 418    | euphausiids      | euphausiids       | 0.5813 | 57    |
| 418    | forage fish      | sandlance         | 0.0134 | 57    |
| 418    | inshore rockfish | rockfish          | 0.0075 | 57    |
| 418    | lingcod          | lingcod           | 0.0003 | 57    |
| 418    | macrobenthos     | anomurans         | 0.0000 | 57    |

|     |                           |                          |        |    |
|-----|---------------------------|--------------------------|--------|----|
| 418 | macrobenthos              | crabs                    | 0.0686 | 57 |
| 418 | macrobenthos              | crustacea with mandibles | 0.0254 | 57 |
| 418 | macrobenthos              | gastropods               | 0.0430 | 57 |
| 418 | meiobenthos               | annelids                 | 0.0004 | 57 |
| 418 | meiobenthos               | nematodes                | 0.0005 | 57 |
| 418 | other fish                | bony fishes              | 0.0030 | 57 |
| 418 | other fish                | unid fish                | 0.0159 | 57 |
| 418 | other flatfish            | flatfishes               | 0.0002 | 57 |
| 418 | petrale sole              | petrale sole             | 0.0025 | 57 |
| 418 | predatory invertebrates   | cephalopods              | 0.0034 | 57 |
| 418 | predatory mesozooplankton | amphipods                | 0.0003 | 57 |
| 418 | predatory mesozooplankton | cumaceans                | 0.0015 | 57 |
| 418 | predatory mesozooplankton | gammarids                | 0.0008 | 57 |
| 418 | predatory mesozooplankton | hyperid amphipods        | 0.0002 | 57 |
| 418 | shallowwater benthic fish | sculpins                 | 0.0011 | 57 |
| 418 | shrimp                    | shrimp                   | 0.2250 | 57 |
| 418 | squid                     | squid                    | 0.0030 | 57 |

#### SEBASTES PAUCISPINIS

| PredID | Ecopath grouping | Ecopath Sub Group | AvgP   | nStom |
|--------|------------------|-------------------|--------|-------|
| 435    | meiobenthos      | nematodes         | 0.0009 | 8     |
| 435    | other fish       | bony fishes       | 0.0728 | 8     |
| 435    | other fish       | unid fish         | 0.0527 | 8     |
| 435    | turbot           | turbot            | 0.0228 | 8     |
| 435    | walleye pollock  | walleye pollock   | 0.8508 | 8     |

#### SABLEFISH

| PredID | Ecopath grouping         | Ecopath Sub Group        | AvgP   | nStom |
|--------|--------------------------|--------------------------|--------|-------|
| 455    | dogfish                  | dogfish                  | 0.0263 | 170   |
| 455    | dogfish                  | sharks                   | 0.0070 | 170   |
| 455    | epibenthos               | isopods                  | 0.0006 | 170   |
| 455    | epibenthos               | mysids                   | 0.0000 | 170   |
| 455    | euphausiids              | euphausiids              | 0.5782 | 170   |
| 455    | forage fish              | sandlance                | 0.0199 | 170   |
| 455    | herring                  | herring                  | 0.0288 | 170   |
| 455    | jellies/macrozooplankton | medusae                  | 0.0000 | 170   |
| 455    | macrobenthos             | anomurans                | 0.0089 | 170   |
| 455    | macrobenthos             | ascidians                | 0.0019 | 170   |
| 455    | macrobenthos             | bivalves                 | 0.0016 | 170   |
| 455    | macrobenthos             | cnidaria                 | 0.0366 | 170   |
| 455    | macrobenthos             | crabs                    | 0.0076 | 170   |
| 455    | macrobenthos             | crustacea with mandibles | 0.0032 | 170   |



|     |                           |                   |        |     |
|-----|---------------------------|-------------------|--------|-----|
| 455 | macrobenthos              | echinoderms       | 0.0072 | 170 |
| 455 | macrobenthos              | echiurans         | 0.0074 | 170 |
| 455 | macrobenthos              | gastropods        | 0.0327 | 170 |
| 455 | macrobenthos              | reptantia         | 0.0004 | 170 |
| 455 | meiobenthos               | annelids          | 0.0104 | 170 |
| 455 | other fish                | bony fishes       | 0.0020 | 170 |
| 455 | other fish                | unid fish         | 0.1603 | 170 |
| 455 | phytoplankton             | phytoplankton     | 0.0104 | 170 |
| 455 | predatory mesozooplankton | amphipods         | 0.0002 | 170 |
| 455 | predatory mesozooplankton | gammarids         | 0.0029 | 170 |
| 455 | predatory mesozooplankton | hyperid amphipods | 0.0001 | 170 |
| 455 | shallowwater benthic fish | sculpins          | 0.0035 | 170 |
| 455 | shrimp                    | shrimp            | 0.0385 | 170 |
| 455 | squid                     | squid             | 0.0033 | 170 |

#### LINGCOD

| PredID | Ecopath grouping          | Ecopath Sub Group | AvgP   | nStom |
|--------|---------------------------|-------------------|--------|-------|
| 467    | english sole              | english sole      | 0.0851 | 25    |
| 467    | herring                   | herring           | 0.1030 | 25    |
| 467    | meiobenthos               | annelids          | 0.0000 | 25    |
| 467    | meiobenthos               | nematodes         | 0.0009 | 25    |
| 467    | other fish                | bony fishes       | 0.6428 | 25    |
| 467    | other fish                | unid fish         | 0.0027 | 25    |
| 467    | other flatfish            | yellowfin sole    | 0.0721 | 25    |
| 467    | salmon                    | salmon            | 0.0162 | 25    |
| 467    | shallowwater benthic fish | sculpins          | 0.0773 | 25    |

#### PACIFIC SANDDAB

| PredID | Ecopath grouping         | Ecopath Sub Group        | AvgP   | nStom |
|--------|--------------------------|--------------------------|--------|-------|
| 596    | copepods                 | copepods                 | 0.0002 | 90    |
| 596    | epibenthos               | isopods                  | 0.0002 | 90    |
| 596    | epibenthos               | mysids                   | 0.3663 | 90    |
| 596    | euphausiids              | euphausiids              | 0.3852 | 90    |
| 596    | jellies/macrozooplankton | tunicates                | 0.0010 | 90    |
| 596    | macrobenthos             | anomurans                | 0.0227 | 90    |
| 596    | macrobenthos             | ascidians                | 0.0156 | 90    |
| 596    | macrobenthos             | chaetognaths             | 0.0010 | 90    |
| 596    | macrobenthos             | crabs                    | 0.0248 | 90    |
| 596    | macrobenthos             | crustacea with mandibles | 0.0413 | 90    |
| 596    | macrobenthos             | echinoderms              | 0.0006 | 90    |
| 596    | macrobenthos             | gastropods               | 0.0001 | 90    |
| 596    | macrobenthos             | peanut worms             | 0.0000 | 90    |

|     |                           |             |        |    |
|-----|---------------------------|-------------|--------|----|
| 596 | meiobenthos               | annelids    | 0.0122 | 90 |
| 596 | meiobenthos               | nematodes   | 0.0002 | 90 |
| 596 | other fish                | bony fishes | 0.0326 | 90 |
| 596 | other flatfish            | dabs        | 0.0169 | 90 |
| 596 | predatory mesozooplankton | amphipods   | 0.0078 | 90 |
| 596 | predatory mesozooplankton | cumaceans   | 0.0000 | 90 |
| 596 | predatory mesozooplankton | gammarids   | 0.0036 | 90 |
| 596 | shrimp                    | shrimp      | 0.0507 | 90 |
| 596 | turbot                    | turbot      | 0.0170 | 90 |

#### **SPECKLED SANDDAB**

| PredID | Ecopath grouping          | Ecopath Sub Group          | AvgP   | nStom |
|--------|---------------------------|----------------------------|--------|-------|
| 598    | epibenthos                | mysids                     | 0.0486 | 88    |
| 598    | euphausiids               | euphausiids                | 0.0117 | 88    |
| 598    | forage fish               | sandlance                  | 0.1371 | 88    |
| 598    | macrobenthos              | bivalves                   | 0.0007 | 88    |
| 598    | macrobenthos              | crabs                      | 0.0388 | 88    |
| 598    | macrobenthos              | crabs,shrimps and lobsters | 0.0803 | 88    |
| 598    | macrobenthos              | crustacea with mandibles   | 0.0391 | 88    |
| 598    | meiobenthos               | annelids                   | 0.0266 | 88    |
| 598    | other fish                | bony fishes                | 0.0154 | 88    |
| 598    | other fish                | unid fish                  | 0.0174 | 88    |
| 598    | other flatfish            | flatfishes                 | 0.0075 | 88    |
| 598    | predatory mesozooplankton | amphipods                  | 0.0022 | 88    |
| 598    | predatory mesozooplankton | cumaceans                  | 0.0019 | 88    |
| 598    | predatory mesozooplankton | gammarids                  | 0.0185 | 88    |
| 598    | shallowwater benthic fish | clingfishes                | 0.0004 | 88    |
| 598    | shrimp                    | shrimp                     | 0.5540 | 88    |

#### **ARROWTOOTH FLOUNDER**

| PredID | Ecopath grouping | Ecopath Sub Group          | AvgP   | nStom |
|--------|------------------|----------------------------|--------|-------|
| 602    | epibenthos       | mysids                     | 0.0057 | 903   |
| 602    | euphausiids      | euphausiids                | 0.0662 | 903   |
| 602    | forage fish      | eulachon                   | 0.0020 | 903   |
| 602    | forage fish      | sandlance                  | 0.0981 | 903   |
| 602    | herring          | herring                    | 0.1289 | 903   |
| 602    | inshore rockfish | rockfish                   | 0.0150 | 903   |
| 602    | macrobenthos     | bivalves                   | 0.0000 | 903   |
| 602    | macrobenthos     | cnidaria                   | 0.0000 | 903   |
| 602    | macrobenthos     | crabs                      | 0.0228 | 903   |
| 602    | macrobenthos     | crabs,shrimps and lobsters | 0.0742 | 903   |

|     |                           |                          |        |     |
|-----|---------------------------|--------------------------|--------|-----|
| 602 | macrobenthos              | crustacea                | 0.0000 | 903 |
| 602 | macrobenthos              | crustacea with mandibles | 0.0180 | 903 |
| 602 | macrobenthos              | echinoderms              | 0.0003 | 903 |
| 602 | macrobenthos              | gastropods               | 0.0000 | 903 |
| 602 | meiobenthos               | annelids                 | 0.0010 | 903 |
| 602 | meiobenthos               | nematodes                | 0.0004 | 903 |
| 602 | meiobenthos               | proboscis worms          | 0.0000 | 903 |
| 602 | other fish                | bony fishes              | 0.4494 | 903 |
| 602 | other fish                | unid fish                | 0.0559 | 903 |
| 602 | other flatfish            | flatfishes               | 0.0004 | 903 |
| 602 | other flatfish            | flathead sole            | 0.0024 | 903 |
| 602 | predatory invertebrates   | cephalopods              | 0.0005 | 903 |
| 602 | predatory mesozooplankton | amphipods                | 0.0000 | 903 |
| 602 | predatory mesozooplankton | cumaceans                | 0.0000 | 903 |
| 602 | predatory mesozooplankton | decapods                 | 0.0000 | 903 |
| 602 | shallowwater benthic fish | eelpout                  | 0.0017 | 903 |
| 602 | shallowwater benthic fish | gadids                   | 0.0139 | 903 |
| 602 | shallowwater benthic fish | perch                    | 0.0011 | 903 |
| 602 | shallowwater benthic fish | sculpins                 | 0.0066 | 903 |
| 602 | shrimp                    | shrimp                   | 0.0350 | 903 |
| 602 | walleye pollock           | walleye pollock          | 0.0006 | 903 |

#### PETRALE SOLE

| PredID | Ecopath grouping          | Ecopath Sub Group        | AvgP   | nStom |
|--------|---------------------------|--------------------------|--------|-------|
| 607    | epibenthos                | isopods                  | 0.0000 | 104   |
| 607    | epibenthos                | mysids                   | 0.1936 | 104   |
| 607    | euphausiids               | euphausiids              | 0.0355 | 104   |
| 607    | herring                   | herring                  | 0.4879 | 104   |
| 607    | macrobenthos              | anomurans                | 0.0002 | 104   |
| 607    | macrobenthos              | bivalves                 | 0.0021 | 104   |
| 607    | macrobenthos              | crabs                    | 0.0108 | 104   |
| 607    | macrobenthos              | crustacea with mandibles | 0.0048 | 104   |
| 607    | macrobenthos              | echinoderms              | 0.0000 | 104   |
| 607    | meiobenthos               | annelids                 | 0.0001 | 104   |
| 607    | meiobenthos               | nematodes                | 0.0001 | 104   |
| 607    | other fish                | bony fishes              | 0.2113 | 104   |
| 607    | other flatfish            | dabs                     | 0.0002 | 104   |
| 607    | predatory invertebrates   | cephalopods              | 0.0036 | 104   |
| 607    | predatory mesozooplankton | cumaceans                | 0.0000 | 104   |
| 607    | salmon                    | salmon                   | 0.0060 | 104   |
| 607    | shallowwater benthic fish | agonidae                 | 0.0078 | 104   |
| 607    | shallowwater benthic fish | sculpins                 | 0.0060 | 104   |

|     |                 |                 |        |     |
|-----|-----------------|-----------------|--------|-----|
| 607 | shrimp          | shrimp          | 0.0155 | 104 |
| 607 | squid           | squid           | 0.0044 | 104 |
| 607 | walleye pollock | walleye pollock | 0.0102 | 104 |

#### REX SOLE

| PredID | Ecopath grouping          | Ecopath Sub Group        | AvgP   | nStom |
|--------|---------------------------|--------------------------|--------|-------|
| 610    | copepods                  | copepods                 | 0.0000 | 563   |
| 610    | epibenthos                | isopods                  | 0.0020 | 563   |
| 610    | epibenthos                | mysids                   | 0.0007 | 563   |
| 610    | epibenthos                | tanaidaceans             | 0.0000 | 563   |
| 610    | euphausiids               | euphausiids              | 0.0056 | 563   |
| 610    | jellies/macrozooplankton  | medusae                  | 0.0000 | 563   |
| 610    | macrobenthos              | anomurans                | 0.0035 | 563   |
| 610    | macrobenthos              | ascidians                | 0.0000 | 563   |
| 610    | macrobenthos              | bivalves                 | 0.0217 | 563   |
| 610    | macrobenthos              | crabs                    | 0.1700 | 563   |
| 610    | macrobenthos              | crustacea with mandibles | 0.0075 | 563   |
| 610    | macrobenthos              | echinoderms              | 0.0029 | 563   |
| 610    | macrobenthos              | echiurans                | 0.2065 | 563   |
| 610    | macrobenthos              | gastropods               | 0.0002 | 563   |
| 610    | macrobenthos              | reptantia                | 0.0002 | 563   |
| 610    | macrobenthos              | sponges                  | 0.0000 | 563   |
| 610    | meiobenthos               | annelids                 | 0.3498 | 563   |
| 610    | meiobenthos               | nematodes                | 0.0003 | 563   |
| 610    | meiobenthos               | proboscis worms          | 0.0014 | 563   |
| 610    | microzooplankton          | protozoa                 | 0.0000 | 563   |
| 610    | other fish                | unid fish                | 0.0005 | 563   |
| 610    | predatory mesozooplankton | amphipods                | 0.0007 | 563   |
| 610    | predatory mesozooplankton | caprellid amphipods      | 0.0000 | 563   |
| 610    | predatory mesozooplankton | cumaceans                | 0.0018 | 563   |
| 610    | predatory mesozooplankton | decapods                 | 0.0000 | 563   |
| 610    | predatory mesozooplankton | gammarids                | 0.0187 | 563   |
| 610    | predatory mesozooplankton | ostracods                | 0.0000 | 563   |
| 610    | shallowwater benthic fish | sculpins                 | 0.0002 | 563   |
| 610    | shrimp                    | shrimp                   | 0.2058 | 563   |

#### FLATHEAD SOLE

| PredID | Ecopath grouping | Ecopath Sub Group | AvgP   | nStom |
|--------|------------------|-------------------|--------|-------|
| 612    | epibenthos       | isopods           | 0.0001 | 96    |
| 612    | epibenthos       | mysids            | 0.0440 | 96    |
| 612    | euphausiids      | euphausiids       | 0.0029 | 96    |
| 612    | macrobenthos     | bivalves          | 0.0001 | 96    |

|     |                           |                          |        |    |
|-----|---------------------------|--------------------------|--------|----|
| 612 | macrobenthos              | crabs                    | 0.0187 | 96 |
| 612 | macrobenthos              | crustacea with mandibles | 0.0054 | 96 |
| 612 | macrobenthos              | echinoderms              | 0.0779 | 96 |
| 612 | macrobenthos              | gastropods               | 0.0040 | 96 |
| 612 | meiobenthos               | annelids                 | 0.0071 | 96 |
| 612 | other fish                | unid fish                | 0.0135 | 96 |
| 612 | predatory mesozooplankton | gammarids                | 0.0010 | 96 |
| 612 | shrimp                    | shrimp                   | 0.8255 | 96 |

#### **PACIFIC HALIBUT**

| <b>PredID</b> | <b>Ecopath grouping</b>   | <b>Ecopath Sub Group</b> | <b>AvgP</b> | <b>nStom</b> |
|---------------|---------------------------|--------------------------|-------------|--------------|
| 614           | Dover sole                | Dover sole               | 0.0011      | 152          |
| 614           | dungeness crab            | dungeness crab           | 0.0011      | 152          |
| 614           | epibenthos                | mysids                   | 0.0009      | 152          |
| 614           | euphausiids               | euphausiids              | 0.0000      | 152          |
| 614           | forage fish               | sand lance               | 0.1006      | 152          |
| 614           | herring                   | herring                  | 0.0728      | 152          |
| 614           | jellies/macrozooplankton  | medusae                  | 0.0010      | 152          |
| 614           | macrobenthos              | anomurans                | 0.0360      | 152          |
| 614           | macrobenthos              | bivalves                 | 0.1876      | 152          |
| 614           | macrobenthos              | cnidaria                 | 0.0001      | 152          |
| 614           | macrobenthos              | crabs                    | 0.2061      | 152          |
| 614           | macrobenthos              | crustacea with mandibles | 0.0004      | 152          |
| 614           | macrobenthos              | echinoderms              | 0.0001      | 152          |
| 614           | macrobenthos              | echiurans                | 0.0001      | 152          |
| 614           | macrobenthos              | gastropods               | 0.0011      | 152          |
| 614           | macrobenthos              | reptantia                | 0.0114      | 152          |
| 614           | meiobenthos               | annelids                 | 0.0041      | 152          |
| 614           | meiobenthos               | nematodes                | 0.0001      | 152          |
| 614           | meiobenthos               | proboscis worms          | 0.0001      | 152          |
| 614           | other fish                | bony fishes              | 0.0825      | 152          |
| 614           | other fish                | unid fish                | 0.0185      | 152          |
| 614           | other flatfish            | dabs                     | 0.0101      | 152          |
| 614           | other flatfish            | flatfishes               | 0.0346      | 152          |
| 614           | other flatfish            | sand sole                | 0.0300      | 152          |
| 614           | pacific cod               | pacific cod              | 0.0098      | 152          |
| 614           | predatory invertebrates   | cephalopods              | 0.0020      | 152          |
| 614           | predatory invertebrates   | octopus                  | 0.0269      | 152          |
| 614           | predatory mesozooplankton | amphipods                | 0.0000      | 152          |
| 614           | salmon                    | salmon                   | 0.0183      | 152          |
| 614           | shallowwater benthic fish | gadids                   | 0.0182      | 152          |
| 614           | shallowwater benthic fish | pacific tomcod           | 0.0165      | 152          |

|     |                           |                 |        |     |
|-----|---------------------------|-----------------|--------|-----|
| 614 | shallowwater benthic fish | sculpins        | 0.0058 | 152 |
| 614 | shrimp                    | shrimp          | 0.0002 | 152 |
| 614 | squid                     | squid           | 0.0027 | 152 |
| 614 | turbot                    | turbot          | 0.0982 | 152 |
| 614 | walleye pollock           | walleye pollock | 0.0009 | 152 |

#### **BUTTER SOLE**

| PredID | Ecopath grouping          | Ecopath Sub Group | AvgP   | nStom |
|--------|---------------------------|-------------------|--------|-------|
| 619    | epibenthos                | barnacles         | 0.0422 | 5     |
| 619    | forage fish               | sandlance         | 0.8351 | 5     |
| 619    | macrobenthos              | bivalves          | 0.0090 | 5     |
| 619    | meiobenthos               | annelids          | 0.1086 | 5     |
| 619    | predatory mesozooplankton | amphipods         | 0.0031 | 5     |
| 619    | predatory mesozooplankton | gammarids         | 0.0020 | 5     |

#### **ROCK SOLE**

| PredID | Ecopath grouping          | Ecopath Sub Group          | AvgP   | nStom |
|--------|---------------------------|----------------------------|--------|-------|
| 621    | english sole              | english sole               | 0.0060 | 347   |
| 621    | epibenthos                | barnacles                  | 0.0005 | 347   |
| 621    | epibenthos                | isopods                    | 0.0004 | 347   |
| 621    | epibenthos                | mysids                     | 0.0006 | 347   |
| 621    | euphausiids               | euphausiids                | 0.0003 | 347   |
| 621    | forage fish               | sandlance                  | 0.4055 | 347   |
| 621    | macrobenthos              | anomurans                  | 0.0801 | 347   |
| 621    | macrobenthos              | bivalves                   | 0.1087 | 347   |
| 621    | macrobenthos              | cnidaria                   | 0.0006 | 347   |
| 621    | macrobenthos              | crabs                      | 0.0342 | 347   |
| 621    | macrobenthos              | crabs,shrimps and lobsters | 0.0013 | 347   |
| 621    | macrobenthos              | crustacea with mandibles   | 0.0045 | 347   |
| 621    | macrobenthos              | echinoderms                | 0.0080 | 347   |
| 621    | macrobenthos              | echiurans                  | 0.0073 | 347   |
| 621    | macrobenthos              | gastropods                 | 0.0035 | 347   |
| 621    | macrobenthos              | peanut worms               | 0.0000 | 347   |
| 621    | macrobenthos              | reptantia                  | 0.0005 | 347   |
| 621    | meiobenthos               | annelids                   | 0.2507 | 347   |
| 621    | meiobenthos               | bryozoans                  | 0.0024 | 347   |
| 621    | meiobenthos               | proboscis worms            | 0.0082 | 347   |
| 621    | other fish                | bony fishes                | 0.0313 | 347   |
| 621    | other fish                | unid fish                  | 0.0141 | 347   |
| 621    | predatory mesozooplankton | amphipods                  | 0.0009 | 347   |
| 621    | predatory mesozooplankton | cumaceans                  | 0.0000 | 347   |

|     |                           |                   |        |     |
|-----|---------------------------|-------------------|--------|-----|
| 621 | predatory mesozooplankton | decapods          | 0.0072 | 347 |
| 621 | predatory mesozooplankton | gammarids         | 0.0028 | 347 |
| 621 | predatory mesozooplankton | hyperid amphipods | 0.0000 | 347 |
| 621 | shallowwater benthic fish | agonidae          | 0.0000 | 347 |
| 621 | shallowwater benthic fish | perch             | 0.0031 | 347 |
| 621 | shallowwater benthic fish | sculpins          | 0.0001 | 347 |
| 621 | shrimp                    | shrimp            | 0.0127 | 347 |
| 621 | turbot                    | turbot            | 0.0046 | 347 |

#### DOVER SOLE

| PredID | Ecopath grouping          | Ecopath Sub Group          | AvgP   | nStom |
|--------|---------------------------|----------------------------|--------|-------|
| 626    | copepods                  | copepods                   | 0.0000 | 294   |
| 626    | epibenthos                | isopods                    | 0.0020 | 294   |
| 626    | epibenthos                | mysids                     | 0.0001 | 294   |
| 626    | euphausiids               | euphausiids                | 0.0009 | 294   |
| 626    | jellies/macrozooplankton  | medusae                    | 0.0000 | 294   |
| 626    | macrobenthos              | anomurans                  | 0.0032 | 294   |
| 626    | macrobenthos              | ascidians                  | 0.0003 | 294   |
| 626    | macrobenthos              | bivalves                   | 0.0418 | 294   |
| 626    | macrobenthos              | cnidaria                   | 0.1188 | 294   |
| 626    | macrobenthos              | crabs                      | 0.0508 | 294   |
| 626    | macrobenthos              | crabs,shrimps and lobsters | 0.0006 | 294   |
| 626    | macrobenthos              | crustacea with mandibles   | 0.0009 | 294   |
| 626    | macrobenthos              | echinoderms                | 0.1842 | 294   |
| 626    | macrobenthos              | echiurans                  | 0.0215 | 294   |
| 626    | macrobenthos              | gastropods                 | 0.0031 | 294   |
| 626    | macrobenthos              | peanut worms               | 0.0001 | 294   |
| 626    | macrobenthos              | prosobranchs               | 0.0006 | 294   |
| 626    | meiobenthos               | annelids                   | 0.5426 | 294   |
| 626    | meiobenthos               | bryozoans                  | 0.0000 | 294   |
| 626    | meiobenthos               | nematodes                  | 0.0001 | 294   |
| 626    | meiobenthos               | proboscis worms            | 0.0013 | 294   |
| 626    | microzooplankton          | protozoa                   | 0.0001 | 294   |
| 626    | other fish                | bony fishes                | 0.0000 | 294   |
| 626    | predatory mesozooplankton | amphipods                  | 0.0065 | 294   |
| 626    | predatory mesozooplankton | caprellid amphipods        | 0.0001 | 294   |
| 626    | predatory mesozooplankton | cumaceans                  | 0.0026 | 294   |
| 626    | predatory mesozooplankton | decapods                   | 0.0036 | 294   |
| 626    | predatory mesozooplankton | gammarids                  | 0.0084 | 294   |
| 626    | predatory mesozooplankton | hyperid amphipods          | 0.0000 | 294   |
| 626    | predatory mesozooplankton | ostracods                  | 0.0000 | 294   |



| 626                    | shrimp                    | shrimp                   | 0.0055 | 294   |
|------------------------|---------------------------|--------------------------|--------|-------|
| <b>ENGLISH SOLE</b>    |                           |                          |        |       |
| PredID                 | Ecopath grouping          | Ecopath Sub Group        | AvgP   | nStom |
| 628                    | epibenthos                | barnacles                | 0.0000 | 416   |
| 628                    | epibenthos                | isopods                  | 0.0001 | 416   |
| 628                    | epibenthos                | leptostraca              | 0.0001 | 416   |
| 628                    | epibenthos                | mysids                   | 0.0001 | 416   |
| 628                    | euphausiids               | euphausiids              | 0.0007 | 416   |
| 628                    | forage fish               | sandlance                | 0.0818 | 416   |
| 628                    | jellies/macrozooplankton  | medusae                  | 0.0009 | 416   |
| 628                    | macrobenthos              | anomurans                | 0.0000 | 416   |
| 628                    | macrobenthos              | aplacophora              | 0.0000 | 416   |
| 628                    | macrobenthos              | bivalves                 | 0.1015 | 416   |
| 628                    | macrobenthos              | cnidaria                 | 0.0032 | 416   |
| 628                    | macrobenthos              | crabs                    | 0.0219 | 416   |
| 628                    | macrobenthos              | crustacea with mandibles | 0.0019 | 416   |
| 628                    | macrobenthos              | echinoderms              | 0.0617 | 416   |
| 628                    | macrobenthos              | echiurans                | 0.0706 | 416   |
| 628                    | macrobenthos              | gastropods               | 0.0045 | 416   |
| 628                    | macrobenthos              | peanut worms             | 0.0001 | 416   |
| 628                    | meiobenthos               | annelids                 | 0.5873 | 416   |
| 628                    | meiobenthos               | nematodes                | 0.0001 | 416   |
| 628                    | meiobenthos               | proboscis worms          | 0.0321 | 416   |
| 628                    | microzooplankton          | protozoa                 | 0.0010 | 416   |
| 628                    | other fish                | bony fishes              | 0.0000 | 416   |
| 628                    | other fish                | unid fish                | 0.0006 | 416   |
| 628                    | other flatfish            | flatfishes               | 0.0003 | 416   |
| 628                    | predatory mesozooplankton | amphipods                | 0.0106 | 416   |
| 628                    | predatory mesozooplankton | cumaceans                | 0.0053 | 416   |
| 628                    | predatory mesozooplankton | decapods                 | 0.0013 | 416   |
| 628                    | predatory mesozooplankton | gammarids                | 0.0055 | 416   |
| 628                    | predatory mesozooplankton | ostracods                | 0.0000 | 416   |
| 628                    | shrimp                    | shrimp                   | 0.0068 | 416   |
| <b>STARRY FLOUNDER</b> |                           |                          |        |       |
| PredID                 | Ecopath grouping          | Ecopath Sub Group        | AvgP   | nStom |
| 631                    | macrobenthos              | bivalves                 | 0.9731 | 3     |
| 631                    | macrobenthos              | echinoderms              | 0.0260 | 3     |
| 631                    | macrobenthos              | gastropods               | 0.0009 | 3     |

**CURLFIN SOLE**

| PredID | Ecopath grouping | Ecopath Sub Group | AvgP   | nStom |
|--------|------------------|-------------------|--------|-------|
| 635    | meiobenthos      | annelids          | 1.0000 | 1     |

**SAND SOLE**

| PredID | Ecopath grouping          | Ecopath Sub Group        | AvgP   | nStom |
|--------|---------------------------|--------------------------|--------|-------|
| 636    | epibenthos                | mysids                   | 0.0021 | 199   |
| 636    | euphausiids               | euphausiids              | 0.0015 | 199   |
| 636    | forage fish               | sandlance                | 0.3604 | 199   |
| 636    | macrobenthos              | anomurans                | 0.0000 | 199   |
| 636    | macrobenthos              | bivalves                 | 0.0008 | 199   |
| 636    | macrobenthos              | crabs                    | 0.0168 | 199   |
| 636    | macrobenthos              | crustacea with mandibles | 0.0034 | 199   |
| 636    | macrobenthos              | echinoderms              | 0.0018 | 199   |
| 636    | macrobenthos              | gastropods               | 0.0007 | 199   |
| 636    | meiobenthos               | annelids                 | 0.0003 | 199   |
| 636    | other fish                | bony fishes              | 0.0946 | 199   |
| 636    | other fish                | unid fish                | 0.1667 | 199   |
| 636    | other flatfish            | dabs                     | 0.0246 | 199   |
| 636    | other flatfish            | flatfishes               | 0.0541 | 199   |
| 636    | other flatfish            | sand sole                | 0.0127 | 199   |
| 636    | other flatfish            | yellowfin sole           | 0.0042 | 199   |
| 636    | predatory mesozooplankton | amphipods                | 0.0014 | 199   |
| 636    | predatory mesozooplankton | cumaceans                | 0.0004 | 199   |
| 636    | predatory mesozooplankton | gammarids                | 0.0078 | 199   |
| 636    | rock sole                 | rock sole                | 0.0377 | 199   |
| 636    | shallowwater benthic fish | agonidae                 | 0.0006 | 199   |
| 636    | shallowwater benthic fish | pricklebacks             | 0.0010 | 199   |
| 636    | shallowwater benthic fish | sculpins                 | 0.1475 | 199   |
| 636    | shrimp                    | shrimp                   | 0.0587 | 199   |

**APPENDIX 3. DIETS OF ALL PREDATOR FISH EXPRESSED AS ECOPATH GROUPINGS FOR ALL CRUISES (1-4) AND AREAS (A-D).**

nStom is the total number of predator stomachs examined, AvgP is the proportion of stomach contents based on weight (sum =1)

| PredID          | CruiseArea | Ecopath grouping          | AvgP   | nStom |
|-----------------|------------|---------------------------|--------|-------|
| Dogfish         |            |                           |        |       |
| <b>Cruise 1</b> |            |                           |        |       |
| 44              | 1 A        | euphausiids               | 0.1057 | 45    |
| 44              | 1 A        | forage fish               | 0.0080 | 45    |
| 44              | 1 A        | Herring                   | 0.1555 | 45    |
| 44              | 1 A        | jellies/macrozooplankton  | 0.0253 | 45    |
| 44              | 1 A        | macrobenthos              | 0.1208 | 45    |
| 44              | 1 A        | meiobenthos               | 0.0042 | 45    |
| 44              | 1 A        | other fish                | 0.5687 | 45    |
| 44              | 1 A        | other flatfish            | 0.0008 | 45    |
| 44              | 1 A        | predatory invertebrates   | 0.0090 | 45    |
| 44              | 1 A        | Shrimp                    | 0.0021 | 45    |
| 44              | 1 B        | forage fish               | 0.1074 | 88    |
| 44              | 1 B        | macrobenthos              | 0.7270 | 88    |
| 44              | 1 B        | meiobenthos               | 0.0631 | 88    |
| 44              | 1 B        | other fish                | 0.0094 | 88    |
| 44              | 1 B        | other flatfish            | 0.0295 | 88    |
| 44              | 1 B        | predatory mesozooplankton | 0.0156 | 88    |
| 44              | 1 B        | shallowwater benthic fish | 0.0045 | 88    |
| 44              | 1 B        | Shrimp                    | 0.0091 | 88    |
| 44              | 1 B        | Squid                     | 0.0343 | 88    |
| 44              | 1 C        | euphausiids               | 0.1317 | 51    |
| 44              | 1 C        | forage fish               | 0.0657 | 51    |
| 44              | 1 C        | Herring                   | 0.0670 | 51    |
| 44              | 1 C        | macrobenthos              | 0.0027 | 51    |
| 44              | 1 C        | other fish                | 0.5926 | 51    |
| 44              | 1 C        | other flatfish            | 0.0649 | 51    |
| 44              | 1 C        | predatory invertebrates   | 0.0598 | 51    |
| 44              | 1 C        | predatory mesozooplankton | 0.0015 | 51    |
| 44              | 1 C        | Shrimp                    | 0.0139 | 51    |
| <b>Cruise 2</b> |            |                           |        |       |
| 44              | 2 A        | euphausiids               | 0.0019 | 32    |
| 44              | 2 A        | forage fish               | 0.1582 | 32    |
| 44              | 2 A        | Herring                   | 0.0727 | 32    |
| 44              | 2 A        | macrobenthos              | 0.0343 | 32    |
| 44              | 2 A        | meiobenthos               | 0.0057 | 32    |
| 44              | 2 A        | other fish                | 0.6152 | 32    |
| 44              | 2 A        | other flatfish            | 0.0397 | 32    |

|          |     |                           |        |     |
|----------|-----|---------------------------|--------|-----|
| 44       | 2 A | phytoplankton             | 0.0024 | 32  |
| 44       | 2 A | predatory invertebrates   | 0.0168 | 32  |
| 44       | 2 A | predatory mesozooplankton | 0.0017 | 32  |
| 44       | 2 A | Ratfish                   | 0.0438 | 32  |
| 44       | 2 A | shallowwater benthic fish | 0.0025 | 32  |
| 44       | 2 A | Shrimp                    | 0.0051 | 32  |
| 44       | 2 B | Epibenthos                | 0.0000 | 329 |
| 44       | 2 B | euphausiids               | 0.0151 | 329 |
| 44       | 2 B | forage fish               | 0.2872 | 329 |
| 44       | 2 B | Herring                   | 0.0455 | 329 |
| 44       | 2 B | jellies/macrozooplankton  | 0.0003 | 329 |
| 44       | 2 B | macrobenthos              | 0.3140 | 329 |
| 44       | 2 B | meiobenthos               | 0.0135 | 329 |
| 44       | 2 B | other fish                | 0.1332 | 329 |
| 44       | 2 B | other flatfish            | 0.0142 | 329 |
| 44       | 2 B | predatory invertebrates   | 0.1124 | 329 |
| 44       | 2 B | predatory mesozooplankton | 0.0179 | 329 |
| 44       | 2 B | rock sole                 | 0.0015 | 329 |
| 44       | 2 B | shallowwater benthic fish | 0.0248 | 329 |
| 44       | 2 B | Shrimp                    | 0.0204 | 329 |
| 44       | 2 C | euphausiids               | 0.6515 | 118 |
| 44       | 2 C | macrobenthos              | 0.1149 | 118 |
| 44       | 2 C | meiobenthos               | 0.0206 | 118 |
| 44       | 2 C | other fish                | 0.1418 | 118 |
| 44       | 2 C | predatory mesozooplankton | 0.0265 | 118 |
| 44       | 2 C | shallowwater benthic fish | 0.0248 | 118 |
| 44       | 2 C | Shrimp                    | 0.0021 | 118 |
| 44       | 2 C | Squid                     | 0.0178 | 118 |
| 44       | 2 D | euphausiids               | 0.0042 | 2   |
| 44       | 2 D | macrobenthos              | 0.9945 | 2   |
| 44       | 2 D | other fish                | 0.0013 | 2   |
| Cruise 3 |     |                           |        |     |
| 44       | 3 A | macrobenthos              | 0.0018 | 7   |
| 44       | 3 A | meiobenthos               | 0.0151 | 7   |
| 44       | 3 A | other fish                | 0.2669 | 7   |
| 44       | 3 A | other flatfish            | 0.1192 | 7   |
| 44       | 3 A | Ratfish                   | 0.5963 | 7   |
| 44       | 3 A | Shrimp                    | 0.0008 | 7   |
| 44       | 3 C | Herring                   | 0.4757 | 35  |
| 44       | 3 C | macrobenthos              | 0.0006 | 35  |
| 44       | 3 C | meiobenthos               | 0.0013 | 35  |
| 44       | 3 C | other fish                | 0.4143 | 35  |
| 44       | 3 C | other flatfish            | 0.0403 | 35  |
| 44       | 3 C | predatory invertebrates   | 0.0214 | 35  |
| 44       | 3 C | Shrimp                    | 0.0000 | 35  |

|                  |     |                           |        |     |
|------------------|-----|---------------------------|--------|-----|
| 44               | 3 C | Squid                     | 0.0464 | 35  |
| <b>Cruise 4</b>  |     |                           |        |     |
| 44               | 4 A | forage fish               | 0.0010 | 7   |
| 44               | 4 A | macrobenthos              | 0.0491 | 7   |
| 44               | 4 A | other fish                | 0.9499 | 7   |
| 44               | 4 B | english sole              | 0.0336 | 34  |
| 44               | 4 B | euphausiids               | 0.0158 | 34  |
| 44               | 4 B | forage fish               | 0.3872 | 34  |
| 44               | 4 B | macrobenthos              | 0.3615 | 34  |
| 44               | 4 B | meiobenthos               | 0.0300 | 34  |
| 44               | 4 B | other fish                | 0.1233 | 34  |
| 44               | 4 B | predatory mesozooplankton | 0.0470 | 34  |
| 44               | 4 B | Shrimp                    | 0.0016 | 34  |
| 44               | 4 C | Herring                   | 0.1742 | 5   |
| 44               | 4 C | macrobenthos              | 0.0334 | 5   |
| 44               | 4 C | other fish                | 0.1688 | 5   |
| 44               | 4 C | Salmon                    | 0.6236 | 5   |
| 44               | 4 D | euphausiids               | 0.2411 | 3   |
| 44               | 4 D | macrobenthos              | 0.0073 | 3   |
| 44               | 4 D | other fish                | 0.7516 | 3   |
| <b>Big Skate</b> |     |                           |        |     |
| <b>Cruise 1</b>  |     |                           |        |     |
| 56               | 1 C | macrobenthos              | 0.5745 | 1   |
| 56               | 1 C | predatory mesozooplankton | 0.3191 | 1   |
| 56               | 1 C | Shrimp                    | 0.1064 | 1   |
| <b>Cruise 2</b>  |     |                           |        |     |
| 56               | 2 A | meiobenthos               | 0.0015 | 2   |
| 56               | 2 A | other fish                | 0.4141 | 2   |
| 56               | 2 A | Shrimp                    | 0.5844 | 2   |
| 56               | 2 B | jellies/macrozooplankton  | 0.0000 | 110 |
| 56               | 2 B | macrobenthos              | 0.6800 | 110 |
| 56               | 2 B | meiobenthos               | 0.0003 | 110 |
| 56               | 2 B | other fish                | 0.0764 | 110 |
| 56               | 2 B | other flatfish            | 0.0324 | 110 |
| 56               | 2 B | rock sole                 | 0.0009 | 110 |
| 56               | 2 B | shallowwater benthic fish | 0.0045 | 110 |
| 56               | 2 B | Shrimp                    | 0.0140 | 110 |
| 56               | 2 B | jellies/macrozooplankton  | 0.0000 | 110 |
| 56               | 2 D | macrobenthos              | 0.9617 | 1   |
| 56               | 2 D | Shrimp                    | 0.0383 | 1   |
| <b>Cruise 3</b>  |     |                           |        |     |
| 56               | 3 A | macrobenthos              | 0.8760 | 5   |
| 56               | 3 A | meiobenthos               | 0.0001 | 5   |
| 56               | 3 A | other fish                | 0.0157 | 5   |
| 56               | 3 A | other flatfish            | 0.0641 | 5   |

|                |     |                           |        |    |
|----------------|-----|---------------------------|--------|----|
| 56             | 3 A | predatory invertebrates   | 0.0442 | 5  |
| 56             | 3 D | macrobenthos              | 0.0270 | 15 |
| 56             | 3 D | other fish                | 0.2370 | 15 |
| 56             | 3 D | other flatfish            | 0.4106 | 15 |
| 56             | 3 D | predatory invertebrates   | 0.1569 | 15 |
| 56             | 3 D | predatory mesozooplankton | 0.0153 | 15 |
| 56             | 3 D | Squid                     | 0.1533 | 15 |
| Black Skate    |     |                           |        |    |
| Cruise 1       |     |                           |        |    |
| 58             | 1 A | Epibenthos                | 0.0413 | 24 |
| 58             | 1 A | euphausiids               | 0.0014 | 24 |
| 58             | 1 A | macrobenthos              | 0.3793 | 24 |
| 58             | 1 A | meiobenthos               | 0.1404 | 24 |
| 58             | 1 A | predatory mesozooplankton | 0.0684 | 24 |
| 58             | 1 A | shallowwater benthic fish | 0.0008 | 24 |
| 58             | 1 A | Shrimp                    | 0.3684 | 24 |
| 58             | 1 C | macrobenthos              | 0.4336 | 3  |
| 58             | 1 C | predatory mesozooplankton | 0.4965 | 3  |
| 58             | 1 C | Shrimp                    | 0.0699 | 3  |
| Cruise 2       |     |                           |        |    |
| 58             | 2 A | Shrimp                    | 1.0000 | 1  |
| 58             | 2 C | Epibenthos                | 0.0089 | 2  |
| 58             | 2 C | macrobenthos              | 0.3336 | 2  |
| 58             | 2 C | meiobenthos               | 0.0266 | 2  |
| 58             | 2 C | shallowwater benthic fish | 0.0326 | 2  |
| 58             | 2 C | Shrimp                    | 0.5984 | 2  |
| Cruise 3       |     |                           |        |    |
| 58             | 3 A | macrobenthos              | 0.8337 | 2  |
| 58             | 3 A | Shrimp                    | 0.1663 | 2  |
| Longnose Skate |     |                           |        |    |
| Cruise 1       |     |                           |        |    |
| 59             | 1 A | Shrimp                    | 1.0000 | 1  |
| 59             | 1 B | forage fish               | 0.0848 | 20 |
| 59             | 1 B | macrobenthos              | 0.7644 | 20 |
| 59             | 1 B | other fish                | 0.0104 | 20 |
| 59             | 1 B | other flatfish            | 0.1006 | 20 |
| 59             | 1 B | shallowwater benthic fish | 0.0125 | 20 |
| 59             | 1 B | Shrimp                    | 0.0274 | 20 |
| 59             | 1 C | macrobenthos              | 0.8227 | 3  |
| 59             | 1 C | Shrimp                    | 0.1773 | 3  |
| Cruise 2       |     |                           |        |    |
| 59             | 2 A | other flatfish            | 0.6986 | 1  |
| 59             | 2 A | Shrimp                    | 0.3014 | 1  |
| 59             | 2 C | Epibenthos                | 0.0009 | 5  |
| 59             | 2 C | macrobenthos              | 0.1225 | 5  |



|          |     |                           |        |     |
|----------|-----|---------------------------|--------|-----|
| 59       | 2 C | Shrimp                    | 0.8766 | 5   |
| Ratfish  |     |                           |        |     |
| Cruise 1 |     |                           |        |     |
| 66       | 1 A | Epibenthos                | 0.0134 | 107 |
| 66       | 1 A | euphausiids               | 0.0017 | 107 |
| 66       | 1 A | macrobenthos              | 0.7320 | 107 |
| 66       | 1 A | meiobenthos               | 0.1616 | 107 |
| 66       | 1 A | other fish                | 0.0051 | 107 |
| 66       | 1 A | predatory mesozooplankton | 0.0788 | 107 |
| 66       | 1 A | Shrimp                    | 0.0074 | 107 |
| 66       | 1 C | Epibenthos                | 0.0054 | 81  |
| 66       | 1 C | macrobenthos              | 0.6938 | 81  |
| 66       | 1 C | meiobenthos               | 0.1716 | 81  |
| 66       | 1 C | other fish                | 0.0073 | 81  |
| 66       | 1 C | predatory mesozooplankton | 0.1162 | 81  |
| 66       | 1 C | Shrimp                    | 0.0056 | 81  |
| Cruise 2 |     |                           |        |     |
| 66       | 2 C | Epibenthos                | 0.0006 | 70  |
| 66       | 2 C | euphausiids               | 0.0071 | 70  |
| 66       | 2 C | macrobenthos              | 0.7418 | 70  |
| 66       | 2 C | meiobenthos               | 0.1169 | 70  |
| 66       | 2 C | other fish                | 0.0603 | 70  |
| 66       | 2 C | predatory mesozooplankton | 0.0034 | 70  |
| 66       | 2 C | Shrimp                    | 0.0700 | 70  |
| 66       | 2 D | Epibenthos                | 0.0199 | 13  |
| 66       | 2 D | macrobenthos              | 0.7337 | 13  |
| 66       | 2 D | meiobenthos               | 0.0113 | 13  |
| 66       | 2 D | predatory mesozooplankton | 0.2328 | 13  |
| 66       | 2 D | Shrimp                    | 0.0023 | 13  |
| Cruise 3 |     |                           |        |     |
| 66       | 3 A | Epibenthos                | 0.0026 | 123 |
| 66       | 3 A | euphausiids               | 0.0013 | 123 |
| 66       | 3 A | jellies/macrozooplankton  | 0.0001 | 123 |
| 66       | 3 A | macrobenthos              | 0.8842 | 123 |
| 66       | 3 A | meiobenthos               | 0.0269 | 123 |
| 66       | 3 A | other fish                | 0.0385 | 123 |
| 66       | 3 A | predatory invertebrates   | 0.0010 | 123 |
| 66       | 3 A | predatory mesozooplankton | 0.0054 | 123 |
| 66       | 3 A | Salmon                    | 0.0327 | 123 |
| 66       | 3 A | shallowwater benthic fish | 0.0007 | 123 |
| 66       | 3 A | Shrimp                    | 0.0052 | 123 |
| 66       | 3 A | Squid                     | 0.0013 | 123 |
| 66       | 3 C | macrobenthos              | 0.5138 | 34  |
| 66       | 3 C | meiobenthos               | 0.4532 | 34  |
| 66       | 3 C | other fish                | 0.0120 | 34  |



|             |     |                           |        |     |
|-------------|-----|---------------------------|--------|-----|
| 66          | 3 C | predatory mesozooplankton | 0.0210 | 34  |
| 66          | 3 D | macrobenthos              | 0.7023 | 1   |
| 66          | 3 D | other fish                | 0.1421 | 1   |
| 66          | 3 D | Shrimp                    | 0.1556 | 1   |
| Eulachon    |     |                           |        |     |
| Cruise 2    |     |                           |        |     |
| 148         | 2 D | euphausiids               | 0.0166 | 8   |
| 148         | 2 D | macrobenthos              | 0.9834 | 8   |
| Cruise 3    |     |                           |        |     |
| 148         | 3 A | euphausiids               | 1.0000 | 8   |
| Pacific Cod |     |                           |        |     |
| Cruise 1    |     |                           |        |     |
| 222         | 1 A | Epibenthos                | 0.0011 | 21  |
| 222         | 1 A | euphausiids               | 0.0064 | 21  |
| 222         | 1 A | macrobenthos              | 0.2891 | 21  |
| 222         | 1 A | meiobenthos               | 0.0383 | 21  |
| 222         | 1 A | other fish                | 0.2764 | 21  |
| 222         | 1 A | predatory invertebrates   | 0.0005 | 21  |
| 222         | 1 A | predatory mesozooplankton | 0.0114 | 21  |
| 222         | 1 A | Shrimp                    | 0.3768 | 21  |
| 222         | 1 B | forage fish               | 0.8291 | 1   |
| 222         | 1 B | macrobenthos              | 0.1322 | 1   |
| 222         | 1 B | meiobenthos               | 0.0103 | 1   |
| 222         | 1 B | Shrimp                    | 0.0284 | 1   |
| 222         | 1 C | forage fish               | 0.0405 | 44  |
| 222         | 1 C | inshore rockfish          | 0.0102 | 44  |
| 222         | 1 C | macrobenthos              | 0.0276 | 44  |
| 222         | 1 C | meiobenthos               | 0.0359 | 44  |
| 222         | 1 C | other fish                | 0.3967 | 44  |
| 222         | 1 C | other flatfish            | 0.0090 | 44  |
| 222         | 1 C | pacific ocean perch       | 0.1196 | 44  |
| 222         | 1 C | predatory invertebrates   | 0.0004 | 44  |
| 222         | 1 C | predatory mesozooplankton | 0.0085 | 44  |
| 222         | 1 C | shallowwater benthic fish | 0.0026 | 44  |
| 222         | 1 C | Shrimp                    | 0.3490 | 44  |
| Cruise 2    |     |                           |        |     |
| 222         | 2 A | Epibenthos                | 0.0004 | 126 |
| 222         | 2 A | euphausiids               | 0.0010 | 126 |
| 222         | 2 A | forage fish               | 0.7655 | 126 |
| 222         | 2 A | Herring                   | 0.0074 | 126 |
| 222         | 2 A | macrobenthos              | 0.0231 | 126 |
| 222         | 2 A | meiobenthos               | 0.0004 | 126 |
| 222         | 2 A | other fish                | 0.0316 | 126 |
| 222         | 2 A | other flatfish            | 0.0502 | 126 |
| 222         | 2 A | predatory mesozooplankton | 0.0030 | 126 |

|          |     |                           |        |     |
|----------|-----|---------------------------|--------|-----|
| 222      | 2 A | shallowwater benthic fish | 0.0167 | 126 |
| 222      | 2 A | Shrimp                    | 0.0920 | 126 |
| 222      | 2 A | walleye pollock           | 0.0088 | 126 |
| 222      | 2 B | Epibenthos                | 0.0132 | 62  |
| 222      | 2 B | forage fish               | 0.2294 | 62  |
| 222      | 2 B | macrobenthos              | 0.2644 | 62  |
| 222      | 2 B | meiobenthos               | 0.0011 | 62  |
| 222      | 2 B | other fish                | 0.1171 | 62  |
| 222      | 2 B | other flatfish            | 0.0123 | 62  |
| 222      | 2 B | predatory mesozooplankton | 0.0754 | 62  |
| 222      | 2 B | Shrimp                    | 0.2871 | 62  |
| 222      | 2 C | euphausiids               | 0.0205 | 4   |
| 222      | 2 C | macrobenthos              | 0.0078 | 4   |
| 222      | 2 C | meiobenthos               | 0.0036 | 4   |
| 222      | 2 C | shallowwater benthic fish | 0.3681 | 4   |
| 222      | 2 C | Shrimp                    | 0.6000 | 4   |
| 222      | 2 D | Epibenthos                | 0.0034 | 42  |
| 222      | 2 D | euphausiids               | 0.0001 | 42  |
| 222      | 2 D | Herring                   | 0.0582 | 42  |
| 222      | 2 D | macrobenthos              | 0.0044 | 42  |
| 222      | 2 D | other fish                | 0.2145 | 42  |
| 222      | 2 D | other flatfish            | 0.4549 | 42  |
| 222      | 2 D | predatory invertebrates   | 0.0001 | 42  |
| 222      | 2 D | predatory mesozooplankton | 0.0002 | 42  |
| 222      | 2 D | shallowwater benthic fish | 0.0143 | 42  |
| 222      | 2 D | Shrimp                    | 0.0294 | 42  |
| 222      | 2 D | Squid                     | 0.0219 | 42  |
| 222      | 2 D | Turbot                    | 0.0270 | 42  |
| 222      | 2 D | walleye pollock           | 0.1717 | 42  |
| Cruise 3 |     |                           |        |     |
| 222      | 3 A | Epibenthos                | 0.0003 | 38  |
| 222      | 3 A | euphausiids               | 0.0094 | 38  |
| 222      | 3 A | jellies/macrozooplankton  | 0.0002 | 38  |
| 222      | 3 A | macrobenthos              | 0.4028 | 38  |
| 222      | 3 A | meiobenthos               | 0.0403 | 38  |
| 222      | 3 A | other fish                | 0.3508 | 38  |
| 222      | 3 A | other flatfish            | 0.0209 | 38  |
| 222      | 3 A | predatory mesozooplankton | 0.0066 | 38  |
| 222      | 3 A | Shrimp                    | 0.1248 | 38  |
| 222      | 3 A | walleye pollock           | 0.0440 | 38  |
| 222      | 3 B | forage fish               | 0.3984 | 4   |
| 222      | 3 B | macrobenthos              | 0.1564 | 4   |
| 222      | 3 B | meiobenthos               | 0.0203 | 4   |
| 222      | 3 B | other fish                | 0.2341 | 4   |
| 222      | 3 B | predatory mesozooplankton | 0.0554 | 4   |

|          |     |                           |        |    |
|----------|-----|---------------------------|--------|----|
| 222      | 3 B | Shrimp                    | 0.1354 | 4  |
| 222      | 3 C | Herring                   | 0.6182 | 79 |
| 222      | 3 C | macrobenthos              | 0.0209 | 79 |
| 222      | 3 C | meiobenthos               | 0.0063 | 79 |
| 222      | 3 C | microzooplankton          | 0.0000 | 79 |
| 222      | 3 C | other fish                | 0.1537 | 79 |
| 222      | 3 C | other flatfish            | 0.0514 | 79 |
| 222      | 3 C | pacific cod               | 0.0278 | 79 |
| 222      | 3 C | predatory invertebrates   | 0.0322 | 79 |
| 222      | 3 C | predatory mesozooplankton | 0.0012 | 79 |
| 222      | 3 C | shallowwater benthic fish | 0.0032 | 79 |
| 222      | 3 C | Shrimp                    | 0.0549 | 79 |
| 222      | 3 C | Squid                     | 0.0301 | 79 |
| 222      | 3 D | Epibenthos                | 0.0078 | 53 |
| 222      | 3 D | macrobenthos              | 0.7032 | 53 |
| 222      | 3 D | meiobenthos               | 0.0753 | 53 |
| 222      | 3 D | Other                     | 0.0879 | 53 |
| 222      | 3 D | other fish                | 0.0366 | 53 |
| 222      | 3 D | predatory mesozooplankton | 0.0381 | 53 |
| 222      | 3 D | shallowwater benthic fish | 0.0337 | 53 |
| 222      | 3 D | Shrimp                    | 0.0173 | 53 |
| 222      | 3 E | euphausiids               | 0.0006 | 60 |
| 222      | 3 E | inshore rockfish          | 0.1820 | 60 |
| 222      | 3 E | macrobenthos              | 0.0472 | 60 |
| 222      | 3 E | meiobenthos               | 0.0285 | 60 |
| 222      | 3 E | other fish                | 0.5359 | 60 |
| 222      | 3 E | predatory mesozooplankton | 0.0177 | 60 |
| 222      | 3 E | shallowwater benthic fish | 0.1698 | 60 |
| 222      | 3 E | Shrimp                    | 0.0183 | 60 |
| Cruise 4 |     |                           |        |    |
| 222      | 4 A | euphausiids               | 0.1278 | 2  |
| 222      | 4 A | forage fish               | 0.1652 | 2  |
| 222      | 4 A | macrobenthos              | 0.0053 | 2  |
| 222      | 4 A | meiobenthos               | 0.1451 | 2  |
| 222      | 4 A | other fish                | 0.5567 | 2  |
| 222      | 4 B | Epibenthos                | 0.0000 | 28 |
| 222      | 4 B | forage fish               | 0.2246 | 28 |
| 222      | 4 B | macrobenthos              | 0.3490 | 28 |
| 222      | 4 B | meiobenthos               | 0.0173 | 28 |
| 222      | 4 B | other fish                | 0.2940 | 28 |
| 222      | 4 B | other flatfish            | 0.0517 | 28 |
| 222      | 4 B | predatory mesozooplankton | 0.0134 | 28 |
| 222      | 4 B | Shrimp                    | 0.0501 | 28 |
| 222      | 4 C | Copepods                  | 0.0001 | 46 |
| 222      | 4 C | euphausiids               | 0.0002 | 46 |

|                        |     |                           |        |     |
|------------------------|-----|---------------------------|--------|-----|
| 222                    | 4 C | inshore rockfish          | 0.0112 | 46  |
| 222                    | 4 C | macrobenthos              | 0.2137 | 46  |
| 222                    | 4 C | meiobenthos               | 0.1015 | 46  |
| 222                    | 4 C | other fish                | 0.6436 | 46  |
| 222                    | 4 C | predatory invertebrates   | 0.0029 | 46  |
| 222                    | 4 C | predatory mesozooplankton | 0.0115 | 46  |
| 222                    | 4 C | shallowwater benthic fish | 0.0130 | 46  |
| 222                    | 4 C | Shrimp                    | 0.0023 | 46  |
| <b>Walleye Pollock</b> |     |                           |        |     |
| <b>Cruise 1</b>        |     |                           |        |     |
| 228                    | 1 A | Epibenthos                | 0.0028 | 22  |
| 228                    | 1 A | euphausiids               | 0.9330 | 22  |
| 228                    | 1 A | macrobenthos              | 0.0046 | 22  |
| 228                    | 1 A | other fish                | 0.0197 | 22  |
| 228                    | 1 A | predatory mesozooplankton | 0.0014 | 22  |
| 228                    | 1 A | Shrimp                    | 0.0386 | 22  |
| 228                    | 1 B | Shrimp                    | 1.0000 | 1   |
| 228                    | 1 C | Copepods                  | 0.0215 | 110 |
| 228                    | 1 C | Epibenthos                | 0.0008 | 110 |
| 228                    | 1 C | euphausiids               | 0.0085 | 110 |
| 228                    | 1 C | jellies/macrozooplankton  | 0.0001 | 110 |
| 228                    | 1 C | macrobenthos              | 0.0607 | 110 |
| 228                    | 1 C | meiobenthos               | 0.0036 | 110 |
| 228                    | 1 C | other fish                | 0.0288 | 110 |
| 228                    | 1 C | predatory invertebrates   | 0.0004 | 110 |
| 228                    | 1 C | predatory mesozooplankton | 0.0036 | 110 |
| 228                    | 1 C | shallowwater benthic fish | 0.0002 | 110 |
| 228                    | 1 C | Shrimp                    | 0.8718 | 110 |
| <b>Cruise 2</b>        |     |                           |        |     |
| 228                    | 2 C | euphausiids               | 0.7010 | 4   |
| 228                    | 2 C | macrobenthos              | 0.1168 | 4   |
| 228                    | 2 C | meiobenthos               | 0.0080 | 4   |
| 228                    | 2 C | other fish                | 0.0145 | 4   |
| 228                    | 2 C | Shrimp                    | 0.1597 | 4   |
| 228                    | 2 D | Epibenthos                | 0.5308 | 44  |
| 228                    | 2 D | euphausiids               | 0.2123 | 44  |
| 228                    | 2 D | macrobenthos              | 0.0925 | 44  |
| 228                    | 2 D | meiobenthos               | 0.0028 | 44  |
| 228                    | 2 D | other fish                | 0.1060 | 44  |
| 228                    | 2 D | predatory mesozooplankton | 0.0001 | 44  |
| 228                    | 2 D | Shrimp                    | 0.0555 | 44  |
| <b>Cruise 3</b>        |     |                           |        |     |
| 228                    | 3 A | macrobenthos              | 1.0000 | 3   |
| 228                    | 3 C | Copepods                  | 0.0007 | 15  |
| 228                    | 3 C | Epibenthos                | 0.0004 | 15  |

|                      |     |                           |        |    |
|----------------------|-----|---------------------------|--------|----|
| 228                  | 3 C | euphausiids               | 0.0912 | 15 |
| 228                  | 3 C | macrobenthos              | 0.3483 | 15 |
| 228                  | 3 C | predatory mesozooplankton | 0.0179 | 15 |
| 228                  | 3 C | Shrimp                    | 0.5419 | 15 |
| 228                  | 3 D | euphausiids               | 0.0588 | 8  |
| 228                  | 3 D | macrobenthos              | 0.8137 | 8  |
| 228                  | 3 D | Shrimp                    | 0.1275 | 8  |
| Pacific Ocean Perch  |     |                           |        |    |
| Cruise 1             |     |                           |        |    |
| 396                  | 1 A | euphausiids               | 0.9462 | 5  |
| 396                  | 1 A | predatory mesozooplankton | 0.0325 | 5  |
| 396                  | 1 A | Shrimp                    | 0.0213 | 5  |
| 396                  | 1 C | Copepods                  | 0.3126 | 64 |
| 396                  | 1 C | Epibenthos                | 0.0039 | 64 |
| 396                  | 1 C | euphausiids               | 0.2827 | 64 |
| 396                  | 1 C | macrobenthos              | 0.2714 | 64 |
| 396                  | 1 C | other fish                | 0.0623 | 64 |
| 396                  | 1 C | predatory mesozooplankton | 0.0264 | 64 |
| 396                  | 1 C | Shrimp                    | 0.0416 | 64 |
| Cruise 2             |     |                           |        |    |
| 396                  | 2 C | Copepods                  | 0.0002 | 43 |
| 396                  | 2 C | Epibenthos                | 0.0124 | 43 |
| 396                  | 2 C | euphausiids               | 0.8854 | 43 |
| 396                  | 2 C | macrobenthos              | 0.0882 | 43 |
| 396                  | 2 C | Shrimp                    | 0.0138 | 43 |
| Sebastes babcocki    |     |                           |        |    |
| Cruise 1             |     |                           |        |    |
| 401                  | 1 A | Shrimp                    | 1.0000 | 1  |
| Cruise 2             |     |                           |        |    |
| 401                  | 2 C | euphausiids               | 0.0114 | 46 |
| 401                  | 2 C | forage fish               | 0.0122 | 46 |
| 401                  | 2 C | macrobenthos              | 0.4056 | 46 |
| 401                  | 2 C | meiobenthos               | 0.0484 | 46 |
| 401                  | 2 C | other fish                | 0.1736 | 46 |
| 401                  | 2 C | other flatfish            | 0.0250 | 46 |
| 401                  | 2 C | predatory invertebrates   | 0.0314 | 46 |
| 401                  | 2 C | predatory mesozooplankton | 0.0006 | 46 |
| 401                  | 2 C | shallowwater benthic fish | 0.0171 | 46 |
| 401                  | 2 C | Shrimp                    | 0.2333 | 46 |
| 401                  | 2 C | Squid                     | 0.0302 | 46 |
| 401                  | 2 C | walleye pollock           | 0.0111 | 46 |
| Sebastes brevispinis |     |                           |        |    |
| Cruise 1             |     |                           |        |    |
| 405                  | 1 C | euphausiids               | 0.3223 | 8  |
| 405                  | 1 C | other fish                | 0.6776 | 8  |



|                    |     |                           |        |    |
|--------------------|-----|---------------------------|--------|----|
| 405                | 1 C | predatory mesozooplankton | 0.0001 | 8  |
| Cruise 2           |     |                           |        |    |
| 405                | 2 A | jellies/macrozooplankton  | 0.0016 | 5  |
| 405                | 2 A | other fish                | 0.6734 | 5  |
| 405                | 2 A | walleye pollock           | 0.3250 | 5  |
| 405                | 2 C | euphausiids               | 0.3584 | 25 |
| 405                | 2 C | macrobenthos              | 0.0033 | 25 |
| 405                | 2 C | meiobenthos               | 0.0003 | 25 |
| 405                | 2 C | other fish                | 0.6066 | 25 |
| 405                | 2 C | shallowwater benthic fish | 0.0028 | 25 |
| 405                | 2 C | walleye pollock           | 0.0286 | 25 |
| Sebastes elongatus |     |                           |        |    |
| Cruise 2           |     |                           |        |    |
| 414                | 2 C | euphausiids               | 0.8223 | 4  |
| 414                | 2 C | macrobenthos              | 0.1195 | 4  |
| 414                | 2 C | other fish                | 0.0566 | 4  |
| 414                | 2 C | predatory mesozooplankton | 0.0016 | 4  |
| Sebastes flavidus  |     |                           |        |    |
| Cruise 1           |     |                           |        |    |
| 418                | 1 A | Copepods                  | 0.0000 | 12 |
| 418                | 1 A | Epibenthos                | 0.0004 | 12 |
| 418                | 1 A | euphausiids               | 0.6025 | 12 |
| 418                | 1 A | forage fish               | 0.0031 | 12 |
| 418                | 1 A | inshore rockfish          | 0.0220 | 12 |
| 418                | 1 A | Lingcod                   | 0.0010 | 12 |
| 418                | 1 A | macrobenthos              | 0.1485 | 12 |
| 418                | 1 A | meiobenthos               | 0.0010 | 12 |
| 418                | 1 A | other fish                | 0.0469 | 12 |
| 418                | 1 A | other flatfish            | 0.0005 | 12 |
| 418                | 1 A | predatory mesozooplankton | 0.0073 | 12 |
| 418                | 1 A | shallowwater benthic fish | 0.0033 | 12 |
| 418                | 1 A | Shrimp                    | 0.1636 | 12 |
| 418                | 1 C | euphausiids               | 0.0314 | 2  |
| 418                | 1 C | Shrimp                    | 0.9686 | 2  |
| Cruise 2           |     |                           |        |    |
| 418                | 2 C | Epibenthos                | 0.0126 | 26 |
| 418                | 2 C | euphausiids               | 0.6452 | 26 |
| 418                | 2 C | forage fish               | 0.0015 | 26 |
| 418                | 2 C | macrobenthos              | 0.3087 | 26 |
| 418                | 2 C | meiobenthos               | 0.0025 | 26 |
| 418                | 2 C | other fish                | 0.0056 | 26 |
| 418                | 2 C | petrale sole              | 0.0130 | 26 |
| 418                | 2 C | predatory mesozooplankton | 0.0001 | 26 |
| 418                | 2 C | Shrimp                    | 0.0109 | 26 |

|                      |     |                           |        |    |
|----------------------|-----|---------------------------|--------|----|
| Cruise 3             |     |                           |        |    |
| 418                  | 3 A | Epibenthos                | 0.0004 | 17 |
| 418                  | 3 A | euphausiids               | 0.8097 | 17 |
| 418                  | 3 A | forage fish               | 0.0394 | 17 |
| 418                  | 3 A | macrobenthos              | 0.0884 | 17 |
| 418                  | 3 A | meiobenthos               | 0.0000 | 17 |
| 418                  | 3 A | other fish                | 0.0064 | 17 |
| 418                  | 3 A | predatory invertebrates   | 0.0110 | 17 |
| 418                  | 3 A | predatory mesozooplankton | 0.0011 | 17 |
| 418                  | 3 A | Shrimp                    | 0.0339 | 17 |
| 418                  | 3 A | Squid                     | 0.0097 | 17 |
| Sebastes paucispinus |     |                           |        |    |
| Cruise 1             |     |                           |        |    |
| 435                  | 1 A | walleye pollock           | 1.0000 | 1  |
| 435                  | 1 C | other fish                | 1.0000 | 4  |
| Cruise 2             |     |                           |        |    |
| 435                  | 2 A | meiobenthos               | 0.0016 | 1  |
| 435                  | 2 A | other fish                | 0.9984 | 1  |
| 435                  | 2 C | other fish                | 1.0000 | 1  |
| Cruise 3             |     |                           |        |    |
| 435                  | 3 C | meiobenthos               | 0.0325 | 1  |
| 435                  | 3 C | other fish                | 0.0198 | 1  |
| 435                  | 3 C | Turbot                    | 0.9477 | 1  |
| Sablefish            |     |                           |        |    |
| Cruise 1             |     |                           |        |    |
| 455                  | 1 A | Dogfish                   | 0.2264 | 42 |
| 455                  | 1 A | Epibenthos                | 0.0012 | 42 |
| 455                  | 1 A | euphausiids               | 0.0860 | 42 |
| 455                  | 1 A | macrobenthos              | 0.3228 | 42 |
| 455                  | 1 A | meiobenthos               | 0.0092 | 42 |
| 455                  | 1 A | other fish                | 0.2869 | 42 |
| 455                  | 1 A | phytoplankton             | 0.0635 | 42 |
| 455                  | 1 A | predatory mesozooplankton | 0.0019 | 42 |
| 455                  | 1 A | Shrimp                    | 0.0021 | 42 |
| 455                  | 1 C | Epibenthos                | 0.0014 | 36 |
| 455                  | 1 C | euphausiids               | 0.0019 | 36 |
| 455                  | 1 C | forage fish               | 0.2262 | 36 |
| 455                  | 1 C | macrobenthos              | 0.3235 | 36 |
| 455                  | 1 C | meiobenthos               | 0.0884 | 36 |
| 455                  | 1 C | other fish                | 0.0869 | 36 |
| 455                  | 1 C | predatory mesozooplankton | 0.0290 | 36 |
| 455                  | 1 C | Shrimp                    | 0.2053 | 36 |
| 455                  | 1 C | Squid                     | 0.0373 | 36 |
| Cruise 2             |     |                           |        |    |
| 455                  | 2 A | euphausiids               | 0.0338 | 2  |



|                 |     |                           |        |    |
|-----------------|-----|---------------------------|--------|----|
| 455             | 2 A | jellies/macrozooplankton  | 0.0196 | 2  |
| 455             | 2 A | meiobenthos               | 0.5365 | 2  |
| 455             | 2 A | other fish                | 0.2748 | 2  |
| 455             | 2 A | predatory mesozooplankton | 0.0709 | 2  |
| 455             | 2 A | Shrimp                    | 0.0643 | 2  |
| 455             | 2 C | Epibenthos                | 0.0004 | 90 |
| 455             | 2 C | euphausiids               | 0.7399 | 90 |
| 455             | 2 C | Herring                   | 0.0377 | 90 |
| 455             | 2 C | macrobenthos              | 0.0413 | 90 |
| 455             | 2 C | meiobenthos               | 0.0012 | 90 |
| 455             | 2 C | other fish                | 0.1469 | 90 |
| 455             | 2 C | phytoplankton             | 0.0013 | 90 |
| 455             | 2 C | predatory mesozooplankton | 0.0005 | 90 |
| 455             | 2 C | shallowwater benthic fish | 0.0045 | 90 |
| 455             | 2 C | Shrimp                    | 0.0263 | 90 |
| Lingcod         |     |                           |        |    |
| Cruise 1        |     |                           |        |    |
| 467             | 1 C | other fish                | 1.0000 | 1  |
| Cruise 2        |     |                           |        |    |
| 467             | 2 A | Herring                   | 0.5351 | 5  |
| 467             | 2 A | meiobenthos               | 0.0011 | 5  |
| 467             | 2 A | other fish                | 0.4638 | 5  |
| 467             | 2 C | other fish                | 1.0000 | 2  |
| 467             | 2 D | english sole              | 0.4486 | 4  |
| 467             | 2 D | meiobenthos               | 0.0000 | 4  |
| 467             | 2 D | other fish                | 0.5514 | 4  |
| Cruise 3        |     |                           |        |    |
| 467             | 3 C | meiobenthos               | 0.0002 | 11 |
| 467             | 3 C | other fish                | 0.6833 | 11 |
| 467             | 3 C | other flatfish            | 0.1378 | 11 |
| 467             | 3 C | Salmon                    | 0.0309 | 11 |
| 467             | 3 C | shallowwater benthic fish | 0.1477 | 11 |
| 467             | 3 D | meiobenthos               | 0.0142 | 2  |
| 467             | 3 D | other fish                | 0.9858 | 2  |
| Pacific Sanddab |     |                           |        |    |
| Cruise 2        |     |                           |        |    |
| 596             | 2 D | Epibenthos                | 0.4482 | 27 |
| 596             | 2 D | euphausiids               | 0.4349 | 27 |
| 596             | 2 D | macrobenthos              | 0.0306 | 27 |
| 596             | 2 D | other fish                | 0.0393 | 27 |
| 596             | 2 D | other flatfish            | 0.0207 | 27 |
| 596             | 2 D | predatory mesozooplankton | 0.0004 | 27 |
| 596             | 2 D | Shrimp                    | 0.0051 | 27 |
| 596             | 2 D | Turbot                    | 0.0208 | 27 |
| Cruise 3        |     |                           |        |    |

|                  |     |                           |        |     |
|------------------|-----|---------------------------|--------|-----|
| 596              | 3 A | euphausiids               | 0.5942 | 1   |
| 596              | 3 A | Shrimp                    | 0.4058 | 1   |
| 596              | 3 D | Copepods                  | 0.0012 | 62  |
| 596              | 3 D | Epibenthos                | 0.0011 | 62  |
| 596              | 3 D | euphausiids               | 0.1595 | 62  |
| 596              | 3 D | jellies/macrozooplankton  | 0.0056 | 62  |
| 596              | 3 D | macrobenthos              | 0.4474 | 62  |
| 596              | 3 D | meiobenthos               | 0.0683 | 62  |
| 596              | 3 D | other fish                | 0.0025 | 62  |
| 596              | 3 D | predatory mesozooplankton | 0.0608 | 62  |
| 596              | 3 D | Shrimp                    | 0.2538 | 62  |
| Speckled Sanddab |     |                           |        |     |
| Cruise 1         |     |                           |        |     |
| 598              | 1 B | Epibenthos                | 0.0510 | 85  |
| 598              | 1 B | euphausiids               | 0.0138 | 85  |
| 598              | 1 B | macrobenthos              | 0.1856 | 85  |
| 598              | 1 B | meiobenthos               | 0.0314 | 85  |
| 598              | 1 B | other fish                | 0.0387 | 85  |
| 598              | 1 B | other flatfish            | 0.0088 | 85  |
| 598              | 1 B | predatory mesozooplankton | 0.0266 | 85  |
| 598              | 1 B | shallowwater benthic fish | 0.0004 | 85  |
| 598              | 1 B | Shrimp                    | 0.6437 | 85  |
| Cruise 2         |     |                           |        |     |
| 598              | 2 B | Epibenthos                | 0.3876 | 2   |
| 598              | 2 B | Shrimp                    | 0.6124 | 2   |
| Cruise 3         |     |                           |        |     |
| 598              | 3 B | forage fish               | 0.9882 | 1   |
| 598              | 3 B | macrobenthos              | 0.0118 | 1   |
| Turbot           |     |                           |        |     |
| Cruise 1         |     |                           |        |     |
| 602              | 1 A | euphausiids               | 0.4790 | 264 |
| 602              | 1 A | forage fish               | 0.0011 | 264 |
| 602              | 1 A | Herring                   | 0.3572 | 264 |
| 602              | 1 A | macrobenthos              | 0.0397 | 264 |
| 602              | 1 A | meiobenthos               | 0.0096 | 264 |
| 602              | 1 A | other fish                | 0.0955 | 264 |
| 602              | 1 A | predatory mesozooplankton | 0.0001 | 264 |
| 602              | 1 A | Shrimp                    | 0.0178 | 264 |
| 602              | 1 C | euphausiids               | 0.0017 | 70  |
| 602              | 1 C | forage fish               | 0.0393 | 70  |
| 602              | 1 C | Herring                   | 0.2915 | 70  |
| 602              | 1 C | macrobenthos              | 0.1072 | 70  |
| 602              | 1 C | other fish                | 0.4132 | 70  |
| 602              | 1 C | other flatfish            | 0.0075 | 70  |
| 602              | 1 C | Shrimp                    | 0.1394 | 70  |

|          |     |                           |        |     |
|----------|-----|---------------------------|--------|-----|
| Cruise 2 |     |                           |        |     |
| 602      | 2 A | euphausiids               | 0.0004 | 101 |
| 602      | 2 A | forage fish               | 0.2675 | 101 |
| 602      | 2 A | Herring                   | 0.0799 | 101 |
| 602      | 2 A | macrobenthos              | 0.0191 | 101 |
| 602      | 2 A | meiobenthos               | 0.0003 | 101 |
| 602      | 2 A | other fish                | 0.5846 | 101 |
| 602      | 2 A | shallowwater benthic fish | 0.0302 | 101 |
| 602      | 2 A | Shrimp                    | 0.0163 | 101 |
| 602      | 2 A | walleye pollock           | 0.0018 | 101 |
| 602      | 2 C | Epibenthos                | 0.0000 | 205 |
| 602      | 2 C | euphausiids               | 0.0470 | 205 |
| 602      | 2 C | Herring                   | 0.1021 | 205 |
| 602      | 2 C | inshore rockfish          | 0.0490 | 205 |
| 602      | 2 C | macrobenthos              | 0.1496 | 205 |
| 602      | 2 C | meiobenthos               | 0.0016 | 205 |
| 602      | 2 C | other fish                | 0.6056 | 205 |
| 602      | 2 C | other flatfish            | 0.0077 | 205 |
| 602      | 2 C | shallowwater benthic fish | 0.0055 | 205 |
| 602      | 2 C | Shrimp                    | 0.0320 | 205 |
| 602      | 2 D | Epibenthos                | 0.1882 | 49  |
| 602      | 2 D | euphausiids               | 0.0297 | 49  |
| 602      | 2 D | Herring                   | 0.1828 | 49  |
| 602      | 2 D | macrobenthos              | 0.0595 | 49  |
| 602      | 2 D | meiobenthos               | 0.0001 | 49  |
| 602      | 2 D | other fish                | 0.3982 | 49  |
| 602      | 2 D | shallowwater benthic fish | 0.1415 | 49  |
| Cruise 3 |     |                           |        |     |
| 602      | 3 A | euphausiids               | 0.0975 | 120 |
| 602      | 3 A | forage fish               | 0.0179 | 120 |
| 602      | 3 A | Herring                   | 0.1565 | 120 |
| 602      | 3 A | macrobenthos              | 0.4049 | 120 |
| 602      | 3 A | other fish                | 0.1764 | 120 |
| 602      | 3 A | predatory invertebrates   | 0.0020 | 120 |
| 602      | 3 A | shallowwater benthic fish | 0.0594 | 120 |
| 602      | 3 A | Shrimp                    | 0.0853 | 120 |
| 602      | 3 C | euphausiids               | 0.0003 | 86  |
| 602      | 3 C | macrobenthos              | 0.1141 | 86  |
| 602      | 3 C | meiobenthos               | 0.0005 | 86  |
| 602      | 3 C | other fish                | 0.8715 | 86  |
| 602      | 3 C | predatory invertebrates   | 0.0046 | 86  |
| 602      | 3 C | predatory mesozooplankton | 0.0002 | 86  |
| 602      | 3 C | Shrimp                    | 0.0089 | 86  |
| 602      | 3 D | Epibenthos                | 0.0040 | 8   |
| 602      | 3 D | euphausiids               | 0.0712 | 8   |

|              |     |                           |        |     |
|--------------|-----|---------------------------|--------|-----|
| 602          | 3 D | macrobenthos              | 0.5405 | 8   |
| 602          | 3 D | other fish                | 0.3832 | 8   |
| 602          | 3 D | predatory mesozooplankton | 0.0011 | 8   |
| Petrale Sole |     |                           |        |     |
| Cruise 1     |     |                           |        |     |
| 607          | 1 A | Epibenthos                | 0.0053 | 2   |
| 607          | 1 A | macrobenthos              | 0.3467 | 2   |
| 607          | 1 A | Shrimp                    | 0.6480 | 2   |
| Cruise 2     |     |                           |        |     |
| 607          | 2 D | Epibenthos                | 0.5861 | 55  |
| 607          | 2 D | euphausiids               | 0.1028 | 55  |
| 607          | 2 D | macrobenthos              | 0.0292 | 55  |
| 607          | 2 D | meiobenthos               | 0.0000 | 55  |
| 607          | 2 D | other fish                | 0.2294 | 55  |
| 607          | 2 D | other flatfish            | 0.0006 | 55  |
| 607          | 2 D | predatory mesozooplankton | 0.0000 | 55  |
| 607          | 2 D | shallowwater benthic fish | 0.0003 | 55  |
| 607          | 2 D | Shrimp                    | 0.0170 | 55  |
| 607          | 2 D | Squid                     | 0.0037 | 55  |
| 607          | 2 D | walleye pollock           | 0.0308 | 55  |
| Cruise 3     |     |                           |        |     |
| 607          | 3 C | euphausiids               | 0.0023 | 45  |
| 607          | 3 C | Herring                   | 0.7310 | 45  |
| 607          | 3 C | macrobenthos              | 0.0110 | 45  |
| 607          | 3 C | meiobenthos               | 0.0002 | 45  |
| 607          | 3 C | other fish                | 0.2031 | 45  |
| 607          | 3 C | predatory invertebrates   | 0.0054 | 45  |
| 607          | 3 C | Salmon                    | 0.0090 | 45  |
| 607          | 3 C | shallowwater benthic fish | 0.0205 | 45  |
| 607          | 3 C | Shrimp                    | 0.0129 | 45  |
| 607          | 3 C | Squid                     | 0.0047 | 45  |
| 607          | 3 D | macrobenthos              | 1.0000 | 2   |
| Rex Sole     |     |                           |        |     |
| Cruise 1     |     |                           |        |     |
| 610          | 1 A | Epibenthos                | 0.0017 | 130 |
| 610          | 1 A | euphausiids               | 0.0005 | 130 |
| 610          | 1 A | macrobenthos              | 0.6958 | 130 |
| 610          | 1 A | meiobenthos               | 0.2693 | 130 |
| 610          | 1 A | predatory mesozooplankton | 0.0126 | 130 |
| 610          | 1 A | Shrimp                    | 0.0200 | 130 |
| 610          | 1 C | Epibenthos                | 0.0139 | 98  |
| 610          | 1 C | euphausiids               | 0.0005 | 98  |
| 610          | 1 C | macrobenthos              | 0.0335 | 98  |
| 610          | 1 C | meiobenthos               | 0.9236 | 98  |
| 610          | 1 C | microzooplankton          | 0.0000 | 98  |

|               |     |                           |        |     |
|---------------|-----|---------------------------|--------|-----|
| 610           | 1 C | predatory mesozooplankton | 0.0262 | 98  |
| 610           | 1 C | Shrimp                    | 0.0023 | 98  |
| Cruise 2      |     |                           |        |     |
| 610           | 2 A | Epibenthos                | 0.0007 | 34  |
| 610           | 2 A | macrobenthos              | 0.0632 | 34  |
| 610           | 2 A | meiobenthos               | 0.1258 | 34  |
| 610           | 2 A | other fish                | 0.0006 | 34  |
| 610           | 2 A | predatory mesozooplankton | 0.0096 | 34  |
| 610           | 2 A | Shrimp                    | 0.8002 | 34  |
| 610           | 2 C | Epibenthos                | 0.0010 | 148 |
| 610           | 2 C | euphausiids               | 0.0018 | 148 |
| 610           | 2 C | macrobenthos              | 0.0435 | 148 |
| 610           | 2 C | meiobenthos               | 0.7541 | 148 |
| 610           | 2 C | other fish                | 0.0015 | 148 |
| 610           | 2 C | predatory mesozooplankton | 0.0748 | 148 |
| 610           | 2 C | shallowwater benthic fish | 0.0020 | 148 |
| 610           | 2 C | Shrimp                    | 0.1213 | 148 |
| 610           | 2 D | Copepods                  | 0.0000 | 46  |
| 610           | 2 D | Epibenthos                | 0.0035 | 46  |
| 610           | 2 D | macrobenthos              | 0.6636 | 46  |
| 610           | 2 D | meiobenthos               | 0.2440 | 46  |
| 610           | 2 D | other fish                | 0.0017 | 46  |
| 610           | 2 D | predatory mesozooplankton | 0.0214 | 46  |
| 610           | 2 D | Shrimp                    | 0.0659 | 46  |
| Cruise 3      |     |                           |        |     |
| 610           | 3 A | euphausiids               | 0.1472 | 23  |
| 610           | 3 A | jellies/macrozooplankton  | 0.0002 | 23  |
| 610           | 3 A | macrobenthos              | 0.5186 | 23  |
| 610           | 3 A | meiobenthos               | 0.2973 | 23  |
| 610           | 3 A | predatory mesozooplankton | 0.0010 | 23  |
| 610           | 3 A | Shrimp                    | 0.0358 | 23  |
| 610           | 3 C | euphausiids               | 0.0039 | 69  |
| 610           | 3 C | macrobenthos              | 0.1454 | 69  |
| 610           | 3 C | meiobenthos               | 0.7486 | 69  |
| 610           | 3 C | predatory mesozooplankton | 0.0667 | 69  |
| 610           | 3 C | Shrimp                    | 0.0356 | 69  |
| 610           | 3 D | euphausiids               | 0.0008 | 15  |
| 610           | 3 D | macrobenthos              | 0.8241 | 15  |
| 610           | 3 D | meiobenthos               | 0.0917 | 15  |
| 610           | 3 D | predatory mesozooplankton | 0.0833 | 15  |
| Flathead Sole |     |                           |        |     |
| Cruise 1      |     |                           |        |     |
| 612           | 1 C | Epibenthos                | 0.0014 | 19  |
| 612           | 1 C | macrobenthos              | 0.9716 | 19  |
| 612           | 1 C | meiobenthos               | 0.0270 | 19  |



|                 |     |                           |        | Cruise 2 |
|-----------------|-----|---------------------------|--------|----------|
| 612             | 2 C | Epibenthos                | 0.0472 | 69       |
| 612             | 2 C | euphausiids               | 0.0014 | 69       |
| 612             | 2 C | macrobenthos              | 0.0480 | 69       |
| 612             | 2 C | meiobenthos               | 0.0064 | 69       |
| 612             | 2 C | other fish                | 0.0145 | 69       |
| 612             | 2 C | predatory mesozooplankton | 0.0010 | 69       |
| 612             | 2 C | Shrimp                    | 0.8814 | 69       |
|                 |     |                           |        | Cruise 3 |
| 612             | 3 C | euphausiids               | 0.0567 | 8        |
| 612             | 3 C | macrobenthos              | 0.7912 | 8        |
| 612             | 3 C | Shrimp                    | 0.1521 | 8        |
| Pacific Halibut |     |                           |        |          |
| Cruise 1        |     |                           |        |          |
| 614             | 1 A | macrobenthos              | 1.0000 | 2        |
| 614             | 1 B | dungeness crab            | 0.0036 | 30       |
| 614             | 1 B | forage fish               | 0.0265 | 30       |
| 614             | 1 B | jellies/macrozooplankton  | 0.0027 | 30       |
| 614             | 1 B | macrobenthos              | 0.8574 | 30       |
| 614             | 1 B | other fish                | 0.0219 | 30       |
| 614             | 1 B | other flatfish            | 0.0689 | 30       |
| 614             | 1 B | shallowwater benthic fish | 0.0190 | 30       |
| 614             | 1 C | macrobenthos              | 0.9453 | 4        |
| 614             | 1 C | other fish                | 0.0547 | 4        |
| Cruise 2        |     |                           |        |          |
| 614             | 2 A | Dover sole                | 0.0027 | 88       |
| 614             | 2 A | forage fish               | 0.2241 | 88       |
| 614             | 2 A | Herring                   | 0.1085 | 88       |
| 614             | 2 A | jellies/macrozooplankton  | 0.0002 | 88       |
| 614             | 2 A | macrobenthos              | 0.0948 | 88       |
| 614             | 2 A | meiobenthos               | 0.0099 | 88       |
| 614             | 2 A | other fish                | 0.1464 | 88       |
| 614             | 2 A | other flatfish            | 0.0675 | 88       |
| 614             | 2 A | pacific cod               | 0.0113 | 88       |
| 614             | 2 A | predatory invertebrates   | 0.0581 | 88       |
| 614             | 2 A | predatory mesozooplankton | 0.0000 | 88       |
| 614             | 2 A | shallowwater benthic fish | 0.0321 | 88       |
| 614             | 2 A | Shrimp                    | 0.0004 | 88       |
| 614             | 2 A | Turbot                    | 0.2439 | 88       |
| 614             | 2 B | forage fish               | 0.0228 | 9        |
| 614             | 2 B | jellies/macrozooplankton  | 0.0006 | 9        |
| 614             | 2 B | macrobenthos              | 0.7106 | 9        |
| 614             | 2 B | other fish                | 0.0767 | 9        |
| 614             | 2 B | other flatfish            | 0.1414 | 9        |
| 614             | 2 B | predatory invertebrates   | 0.0197 | 9        |

|                    |     |                           |        |     |
|--------------------|-----|---------------------------|--------|-----|
| 614                | 2 B | shallowwater benthic fish | 0.0196 | 9   |
| 614                | 2 B | Shrimp                    | 0.0001 | 9   |
| 614                | 2 B | walleye pollock           | 0.0084 | 9   |
| 614                | 2 D | Epibenthos                | 0.0270 | 5   |
| 614                | 2 D | euphausiids               | 0.0013 | 5   |
| 614                | 2 D | other flatfish            | 0.3890 | 5   |
| 614                | 2 D | Salmon                    | 0.5827 | 5   |
| <b>Cruise 3</b>    |     |                           |        |     |
| 614                | 3 A | macrobenthos              | 0.9771 | 2   |
| 614                | 3 A | meiobenthos               | 0.0229 | 2   |
| 614                | 3 B | macrobenthos              | 1.0000 | 2   |
| 614                | 3 C | Herring                   | 0.4495 | 7   |
| 614                | 3 C | meiobenthos               | 0.0041 | 7   |
| 614                | 3 C | other fish                | 0.3723 | 7   |
| 614                | 3 C | shallowwater benthic fish | 0.1740 | 7   |
| 614                | 3 D | pacific cod               | 0.2608 | 3   |
| 614                | 3 D | predatory invertebrates   | 0.1767 | 3   |
| 614                | 3 D | shallowwater benthic fish | 0.4260 | 3   |
| 614                | 3 D | Squid                     | 0.1365 | 3   |
| <b>Butter Sole</b> |     |                           |        |     |
| <b>Cruise 2</b>    |     |                           |        |     |
| 619                | 2 B | Epibenthos                | 0.0428 | 4   |
| 619                | 2 B | forage fish               | 0.8471 | 4   |
| 619                | 2 B | meiobenthos               | 0.1101 | 4   |
| <b>Cruise 3</b>    |     |                           |        |     |
| 619                | 3 D | macrobenthos              | 0.6389 | 1   |
| 619                | 3 D | predatory mesozooplankton | 0.3611 | 1   |
| <b>Rock Sole</b>   |     |                           |        |     |
| <b>Cruise 1</b>    |     |                           |        |     |
| 621                | 1 B | Epibenthos                | 0.0002 | 178 |
| 621                | 1 B | forage fish               | 0.1236 | 178 |
| 621                | 1 B | macrobenthos              | 0.3655 | 178 |
| 621                | 1 B | meiobenthos               | 0.4154 | 178 |
| 621                | 1 B | other fish                | 0.0585 | 178 |
| 621                | 1 B | predatory mesozooplankton | 0.0174 | 178 |
| 621                | 1 B | shallowwater benthic fish | 0.0055 | 178 |
| 621                | 1 B | Shrimp                    | 0.0139 | 178 |
| <b>Cruise 2</b>    |     |                           |        |     |
| 621                | 2 A | macrobenthos              | 1.0000 | 1   |
| 621                | 2 B | Epibenthos                | 0.0010 | 121 |
| 621                | 2 B | forage fish               | 0.9359 | 121 |
| 621                | 2 B | macrobenthos              | 0.0248 | 121 |
| 621                | 2 B | meiobenthos               | 0.0215 | 121 |
| 621                | 2 B | other fish                | 0.0048 | 121 |
| 621                | 2 B | predatory mesozooplankton | 0.0004 | 121 |



|            |     |                           |        |     |
|------------|-----|---------------------------|--------|-----|
| 621        | 2 B | Shrimp                    | 0.0114 | 121 |
| 621        | 2 D | Epibenthos                | 0.0169 | 31  |
| 621        | 2 D | euphausiids               | 0.0061 | 31  |
| 621        | 2 D | macrobenthos              | 0.5596 | 31  |
| 621        | 2 D | meiobenthos               | 0.1907 | 31  |
| 621        | 2 D | other fish                | 0.0943 | 31  |
| 621        | 2 D | predatory mesozooplankton | 0.0108 | 31  |
| 621        | 2 D | shallowwater benthic fish | 0.0008 | 31  |
| 621        | 2 D | Shrimp                    | 0.0091 | 31  |
| 621        | 2 D | Turbot                    | 0.1117 | 31  |
| Cruise 3   |     |                           |        |     |
| 621        | 3 A | other fish                | 1.0007 | 1   |
| 621        | 3 B | english sole              | 0.1912 | 9   |
| 621        | 3 B | euphausiids               | 0.0005 | 9   |
| 621        | 3 B | forage fish               | 0.4835 | 9   |
| 621        | 3 B | macrobenthos              | 0.1456 | 9   |
| 621        | 3 B | meiobenthos               | 0.0042 | 9   |
| 621        | 3 B | other fish                | 0.1615 | 9   |
| 621        | 3 B | predatory mesozooplankton | 0.0075 | 9   |
| 621        | 3 B | Shrimp                    | 0.0061 | 9   |
| 621        | 3 D | Epibenthos                | 0.0503 | 6   |
| 621        | 3 D | macrobenthos              | 0.0820 | 6   |
| 621        | 3 D | meiobenthos               | 0.8414 | 6   |
| 621        | 3 D | predatory mesozooplankton | 0.0007 | 6   |
| 621        | 3 D | Shrimp                    | 0.0259 | 6   |
| Dover Sole |     |                           |        |     |
| Cruise 1   |     |                           |        |     |
| 626        | 1 A | Epibenthos                | 0.0038 | 86  |
| 626        | 1 A | euphausiids               | 0.0011 | 86  |
| 626        | 1 A | macrobenthos              | 0.4822 | 86  |
| 626        | 1 A | meiobenthos               | 0.5031 | 86  |
| 626        | 1 A | predatory mesozooplankton | 0.0082 | 86  |
| 626        | 1 A | Shrimp                    | 0.0016 | 86  |
| 626        | 1 C | macrobenthos              | 0.2303 | 27  |
| 626        | 1 C | meiobenthos               | 0.7449 | 27  |
| 626        | 1 C | predatory mesozooplankton | 0.0247 | 27  |
| Cruise 2   |     |                           |        |     |
| 626        | 2 A | macrobenthos              | 0.5241 | 3   |
| 626        | 2 A | meiobenthos               | 0.4736 | 3   |
| 626        | 2 A | predatory mesozooplankton | 0.0026 | 3   |
| 626        | 2 C | Copepods                  | 0.0001 | 170 |
| 626        | 2 C | Epibenthos                | 0.0005 | 170 |
| 626        | 2 C | euphausiids               | 0.0009 | 170 |
| 626        | 2 C | jellies/macrozooplankton  | 0.0001 | 170 |

|              |     |                           |        |     |
|--------------|-----|---------------------------|--------|-----|
| 626          | 2 C | macrobenthos              | 0.3775 | 170 |
| 626          | 2 C | meiobenthos               | 0.5739 | 170 |
| 626          | 2 C | microzooplankton          | 0.0003 | 170 |
| 626          | 2 C | other fish                | 0.0001 | 170 |
| 626          | 2 C | predatory mesozooplankton | 0.0368 | 170 |
| 626          | 2 C | Shrimp                    | 0.0104 | 170 |
| 626          | 2 D | macrobenthos              | 0.4264 | 7   |
| 626          | 2 D | meiobenthos               | 0.5682 | 7   |
| 626          | 2 D | predatory mesozooplankton | 0.0062 | 7   |
| Cruise 3     |     |                           |        |     |
| 626          | 3 C | meiobenthos               | 1.0000 | 1   |
| English Sole |     |                           |        |     |
| Cruise 1     |     |                           |        |     |
| 628          | 1 A | Epibenthos                | 0.0001 | 23  |
| 628          | 1 A | jellies/macrozooplankton  | 0.0026 | 23  |
| 628          | 1 A | macrobenthos              | 0.6193 | 23  |
| 628          | 1 A | meiobenthos               | 0.3405 | 23  |
| 628          | 1 A | microzooplankton          | 0.0054 | 23  |
| 628          | 1 A | predatory mesozooplankton | 0.0321 | 23  |
| 628          | 1 B | Epibenthos                | 0.0006 | 74  |
| 628          | 1 B | macrobenthos              | 0.0933 | 74  |
| 628          | 1 B | meiobenthos               | 0.6170 | 74  |
| 628          | 1 B | other fish                | 0.0206 | 74  |
| 628          | 1 B | other flatfish            | 0.0120 | 74  |
| 628          | 1 B | predatory mesozooplankton | 0.0091 | 74  |
| 628          | 1 B | Shrimp                    | 0.2474 | 74  |
| 628          | 1 C | macrobenthos              | 0.1826 | 7   |
| 628          | 1 C | meiobenthos               | 0.8006 | 7   |
| 628          | 1 C | predatory mesozooplankton | 0.0168 | 7   |
| Cruise 2     |     |                           |        |     |
| 628          | 2 A | Epibenthos                | 0.0001 | 11  |
| 628          | 2 A | forage fish               | 0.8408 | 11  |
| 628          | 2 A | macrobenthos              | 0.0562 | 11  |
| 628          | 2 A | meiobenthos               | 0.0869 | 11  |
| 628          | 2 A | predatory mesozooplankton | 0.0159 | 11  |
| 628          | 2 B | macrobenthos              | 0.3617 | 6   |
| 628          | 2 B | meiobenthos               | 0.6543 | 6   |
| 628          | 2 B | predatory mesozooplankton | 0.0053 | 6   |
| 628          | 2 C | macrobenthos              | 0.0578 | 2   |
| 628          | 2 C | meiobenthos               | 0.9056 | 2   |
| 628          | 2 C | predatory mesozooplankton | 0.0365 | 2   |
| 628          | 2 D | Epibenthos                | 0.0010 | 62  |
| 628          | 2 D | euphausiids               | 0.0032 | 62  |
| 628          | 2 D | macrobenthos              | 0.2322 | 62  |
| 628          | 2 D | meiobenthos               | 0.7243 | 62  |

|                 |     |                           |        |     |
|-----------------|-----|---------------------------|--------|-----|
| 628             | 2 D | other fish                | 0.0001 | 62  |
| 628             | 2 D | predatory mesozooplankton | 0.0401 | 62  |
| 628             | 2 D | Shrimp                    | 0.0000 | 62  |
| Cruise 3        |     |                           |        |     |
| 628             | 3 A | euphausiids               | 0.0054 | 39  |
| 628             | 3 A | jellies/macrozooplankton  | 0.0054 | 39  |
| 628             | 3 A | macrobenthos              | 0.5278 | 39  |
| 628             | 3 A | meiobenthos               | 0.4585 | 39  |
| 628             | 3 A | predatory mesozooplankton | 0.0030 | 39  |
| 628             | 3 B | macrobenthos              | 0.9824 | 1   |
| 628             | 3 B | predatory mesozooplankton | 0.0176 | 1   |
| 628             | 3 C | Epibenthos                | 0.0004 | 66  |
| 628             | 3 C | jellies/macrozooplankton  | 0.0001 | 66  |
| 628             | 3 C | macrobenthos              | 0.3139 | 66  |
| 628             | 3 C | meiobenthos               | 0.6703 | 66  |
| 628             | 3 C | microzooplankton          | 0.0008 | 66  |
| 628             | 3 C | predatory mesozooplankton | 0.0149 | 66  |
| 628             | 3 D | Epibenthos                | 0.0001 | 125 |
| 628             | 3 D | macrobenthos              | 0.1128 | 125 |
| 628             | 3 D | meiobenthos               | 0.8615 | 125 |
| 628             | 3 D | predatory mesozooplankton | 0.0258 | 125 |
| Starry Flounder |     |                           |        |     |
| Cruise 1        |     |                           |        |     |
| 621             | 1 C | macrobenthos              | 1.0000 | 3   |
| Curlfin Sole    |     |                           |        |     |
| Cruise 3        |     |                           |        |     |
| 635             | 3 D | meiobenthos               | 1.0000 | 1   |
| Sand Sole       |     |                           |        |     |
| Cruise 1        |     |                           |        |     |
| 636             | 1 B | Epibenthos                | 0.0044 | 103 |
| 636             | 1 B | euphausiids               | 0.0033 | 103 |
| 636             | 1 B | forage fish               | 0.1311 | 103 |
| 636             | 1 B | macrobenthos              | 0.0398 | 103 |
| 636             | 1 B | meiobenthos               | 0.0007 | 103 |
| 636             | 1 B | other fish                | 0.2795 | 103 |
| 636             | 1 B | other flatfish            | 0.1970 | 103 |
| 636             | 1 B | predatory mesozooplankton | 0.0204 | 103 |
| 636             | 1 B | rock sole                 | 0.0825 | 103 |
| 636             | 1 B | shallowwater benthic fish | 0.1333 | 103 |
| 636             | 1 B | Shrimp                    | 0.1079 | 103 |
| Cruise 2        |     |                           |        |     |
| 636             | 2 B | Epibenthos                | 0.0002 | 91  |
| 636             | 2 B | forage fish               | 0.5375 | 91  |
| 636             | 2 B | macrobenthos              | 0.0065 | 91  |
| 636             | 2 B | other fish                | 0.2572 | 91  |

|          |     |                           |        |    |
|----------|-----|---------------------------|--------|----|
| 636      | 2 B | other flatfish            | 0.0107 | 91 |
| 636      | 2 B | predatory mesozooplankton | 0.0007 | 91 |
| 636      | 2 B | shallowwater benthic fish | 0.1716 | 91 |
| 636      | 2 B | Shrimp                    | 0.0156 | 91 |
| Cruise 3 |     |                           |        |    |
| 636      | 3 B | forage fish               | 0.8383 | 5  |
| 636      | 3 B | macrobenthos              | 0.0707 | 5  |
| 636      | 3 B | other fish                | 0.0450 | 5  |
| 636      | 3 B | Shrimp                    | 0.0460 | 5  |

**APPENDIX 4. DIETS OF PREDATOR FISH EXPRESSED AS ECOPATH SUBGROUPINGS FOR ALL CRUISES (1-4) AND AREAS (A-D).**

nStom is the total number of predator stomachs sampled and AvgP is the proportion of stomach contents based on weight(sum=1).

| PredID | Cruise | area | Ecopath grouping          | EcopathSubGroup | AvgP   | nStom |
|--------|--------|------|---------------------------|-----------------|--------|-------|
| 44     | 1 A    |      | Euphausiids               | euphausiids     | 0.1057 | 45    |
| 44     | 1 A    |      | forage fish               | sandlance       | 0.0080 | 45    |
| 44     | 1 A    |      | Herring                   | herring         | 0.1555 | 45    |
| 44     | 1 A    |      | jellies/macrozooplankton  | medusae         | 0.0253 | 45    |
| 44     | 1 A    |      | Macrobenthos              | anomurans       | 0.0068 | 45    |
| 44     | 1 A    |      | Macrobenthos              | bivalves        | 0.0805 | 45    |
| 44     | 1 A    |      | Macrobenthos              | crabs           | 0.0058 | 45    |
|        |        |      |                           | crustacea with  |        | 45    |
| 44     | 1 A    |      | Macrobenthos              | mandibles       | 0.0003 |       |
| 44     | 1 A    |      | Macrobenthos              | echiurans       | 0.0013 | 45    |
| 44     | 1 A    |      | Macrobenthos              | gastropods      | 0.0261 | 45    |
| 44     | 1 A    |      | Meiobenthos               | annelids        | 0.0042 | 45    |
| 44     | 1 A    |      | other fish                | unid fish       | 0.5687 | 45    |
| 44     | 1 A    |      | other flatfish            | flatfishes      | 0.0008 | 45    |
| 44     | 1 A    |      | predatory invertebrates   | octopus         | 0.0090 | 45    |
| 44     | 1 A    |      | Shrimp                    | shrimp          | 0.0021 | 45    |
| 44     | 1 B    |      | forage fish               | sandlance       | 0.1074 | 88    |
| 44     | 1 B    |      | Macrobenthos              | anomurans       | 0.1165 | 88    |
| 44     | 1 B    |      | Macrobenthos              | bivalves        | 0.2699 | 88    |
| 44     | 1 B    |      | Macrobenthos              | crabs           | 0.1937 | 88    |
|        |        |      |                           | crustacea with  |        | 88    |
| 44     | 1 B    |      | Macrobenthos              | mandibles       | 0.0019 |       |
| 44     | 1 B    |      | Macrobenthos              | gastropods      | 0.1395 | 88    |
| 44     | 1 B    |      | Macrobenthos              | molluscs        | 0.0056 | 88    |
| 44     | 1 B    |      | Meiobenthos               | annelids        | 0.0631 | 88    |
| 44     | 1 B    |      | other fish                | bony fishes     | 0.0048 | 88    |
| 44     | 1 B    |      | other fish                | unid fish       | 0.0047 | 88    |
| 44     | 1 B    |      | other flatfish            | flatfishes      | 0.0295 | 88    |
|        |        |      | predatory                 |                 |        | 88    |
| 44     | 1 B    |      | mesozooplankton           | decapods        | 0.0156 |       |
|        |        |      | predatory                 |                 |        | 88    |
| 44     | 1 B    |      | mesozooplankton           | gammarids       | 0.0000 |       |
| 44     | 1 B    |      | shallowwater benthic fish | sculpins        | 0.0017 | 88    |
| 44     | 1 B    |      | shallowwater benthic fish | snailfishes     | 0.0028 | 88    |
| 44     | 1 B    |      | Shrimp                    | shrimp          | 0.0091 | 88    |
| 44     | 1 B    |      | Squid                     | squid           | 0.0343 | 88    |
| 44     | 1 C    |      | Euphausiids               | euphausiids     | 0.1317 | 51    |
| 44     | 1 C    |      | forage fish               | sandlance       | 0.0657 | 51    |
| 44     | 1 C    |      | Herring                   | herring         | 0.0670 | 51    |
| 44     | 1 C    |      | Macrobenthos              | crabs           | 0.0026 | 51    |
| 44     | 1 C    |      | Macrobenthos              | crustacea with  | 0.0001 | 51    |

|    |     |                           |                   |        |     |
|----|-----|---------------------------|-------------------|--------|-----|
|    |     |                           | mandibles         |        |     |
| 44 | 1 C | other fish                | bony fishes       | 0.5362 | 51  |
| 44 | 1 C | other fish                | unid fish         | 0.0564 | 51  |
| 44 | 1 C | other flatfish            | flatfishes        | 0.0594 | 51  |
| 44 | 1 C | other flatfish            | flathead sole     | 0.0054 | 51  |
| 44 | 1 C | predatory invertebrates   | cephalopods       | 0.0396 | 51  |
| 44 | 1 C | predatory invertebrates   | octopus           | 0.0202 | 51  |
|    |     | predatory                 |                   |        | 51  |
| 44 | 1 C | mesozooplankton           | decapods          | 0.0015 |     |
| 44 | 1 C | Shrimp                    | shrimp            | 0.0139 | 51  |
| 44 | 2 A | Euphausiids               | euphausiids       | 0.0019 | 32  |
| 44 | 2 A | forage fish               | sandlance         | 0.1582 | 32  |
| 44 | 2 A | Herring                   | herring           | 0.0727 | 32  |
| 44 | 2 A | Macrobenthos              | anomurans         | 0.0004 | 32  |
| 44 | 2 A | Macrobenthos              | bivalves          | 0.0009 | 32  |
| 44 | 2 A | Macrobenthos              | cnidaria          | 0.0008 | 32  |
| 44 | 2 A | Macrobenthos              | crabs             | 0.0054 | 32  |
|    |     |                           | crabs,shrimps and |        | 32  |
| 44 | 2 A | Macrobenthos              | lobsters          | 0.0013 |     |
|    |     |                           | crustacea with    |        | 32  |
| 44 | 2 A | Macrobenthos              | mandibles         | 0.0020 |     |
| 44 | 2 A | Macrobenthos              | echinoderms       | 0.0001 | 32  |
| 44 | 2 A | Macrobenthos              | echiurans         | 0.0225 | 32  |
| 44 | 2 A | Macrobenthos              | gastropods        | 0.0011 | 32  |
| 44 | 2 A | Macrobenthos              | polyplacophora    | 0.0000 | 32  |
| 44 | 2 A | Meiobenthos               | annelids          | 0.0051 | 32  |
| 44 | 2 A | Meiobenthos               | nematodes         | 0.0001 | 32  |
| 44 | 2 A | Meiobenthos               | proboscis worms   | 0.0004 | 32  |
| 44 | 2 A | other fish                | bony fishes       | 0.6152 | 32  |
| 44 | 2 A | other flatfish            | dabs              | 0.0397 | 32  |
| 44 | 2 A | Phytoplankton             | phytoplankton     | 0.0024 | 32  |
| 44 | 2 A | predatory invertebrates   | cephalopods       | 0.0168 | 32  |
|    |     | predatory                 |                   |        | 32  |
| 44 | 2 A | mesozooplankton           | decapods          | 0.0017 |     |
| 44 | 2 A | Ratfish                   | ratfish           | 0.0438 | 32  |
| 44 | 2 A | shallowwater benthic fish | perch             | 0.0025 | 32  |
| 44 | 2 A | Shrimp                    | shrimp            | 0.0051 | 32  |
| 44 | 2 B | Epibenthos                | barnacles         | 0.0000 | 329 |
| 44 | 2 B | Euphausiids               | euphausiids       | 0.0151 | 329 |
| 44 | 2 B | forage fish               | sandlance         | 0.2872 | 329 |
| 44 | 2 B | Herring                   | herring           | 0.0455 | 329 |
| 44 | 2 B | jellies/macrozooplankton  | medusae           | 0.0003 | 329 |
| 44 | 2 B | Macrobenthos              | anomurans         | 0.1101 | 329 |
| 44 | 2 B | Macrobenthos              | ascidians         | 0.0006 | 329 |
| 44 | 2 B | Macrobenthos              | bivalves          | 0.0819 | 329 |
| 44 | 2 B | Macrobenthos              | branchiopods      | 0.0011 | 329 |
| 44 | 2 B | Macrobenthos              | cnidaria          | 0.0013 | 329 |
| 44 | 2 B | Macrobenthos              | crabs             | 0.0701 | 329 |



|    |     |                           |                            |        |     |
|----|-----|---------------------------|----------------------------|--------|-----|
| 44 | 2 B | Macrobenthos              | crabs,shrimps and lobsters | 0.0006 | 329 |
| 44 | 2 B | Macrobenthos              | crustacea with mandibles   | 0.0060 | 329 |
| 44 | 2 B | Macrobenthos              | gastropods                 | 0.0303 | 329 |
| 44 | 2 B | Macrobenthos              | molluscs                   | 0.0117 | 329 |
| 44 | 2 B | Macrobenthos              | reptantia                  | 0.0003 | 329 |
| 44 | 2 B | Meiobenthos               | annelids                   | 0.0131 | 329 |
| 44 | 2 B | Meiobenthos               | proboscis worms            | 0.0004 | 329 |
| 44 | 2 B | other fish                | bony fishes                | 0.0824 | 329 |
| 44 | 2 B | other fish                | unid fish                  | 0.0508 | 329 |
| 44 | 2 B | other flatfish            | dabs                       | 0.0012 | 329 |
| 44 | 2 B | other flatfish            | flatfishes                 | 0.0130 | 329 |
| 44 | 2 B | predatory invertebrates   | cephalopods                | 0.0001 | 329 |
| 44 | 2 B | predatory invertebrates   | octopus                    | 0.1123 | 329 |
| 44 | 2 B | predatory mesozooplankton | decapods                   | 0.0178 | 329 |
| 44 | 2 B | predatory mesozooplankton | hyperid amphipods          | 0.0001 | 329 |
| 44 | 2 B | rock sole                 | rock sole                  | 0.0015 | 329 |
| 44 | 2 B | shallowwater benthic fish | agonidae                   | 0.0034 | 329 |
| 44 | 2 B | shallowwater benthic fish | lumpfishes                 | 0.0012 | 329 |
| 44 | 2 B | shallowwater benthic fish | perch                      | 0.0029 | 329 |
| 44 | 2 B | shallowwater benthic fish | sculpins                   | 0.0174 | 329 |
| 44 | 2 B | Shrimp                    | shrimp                     | 0.0204 | 329 |
| 44 | 2 C | Euphausiids               | euphausiids                | 0.6515 | 118 |
| 44 | 2 C | Macrobenthos              | anomurans                  | 0.0260 | 118 |
| 44 | 2 C | Macrobenthos              | cnidaria                   | 0.0062 | 118 |
| 44 | 2 C | Macrobenthos              | crabs                      | 0.0503 | 118 |
| 44 | 2 C | Macrobenthos              | crabs,shrimps and lobsters | 0.0189 | 118 |
| 44 | 2 C | Macrobenthos              | crustacea with mandibles   | 0.0113 | 118 |
| 44 | 2 C | Macrobenthos              | lophophorans               | 0.0021 | 118 |
| 44 | 2 C | Meiobenthos               | annelids                   | 0.0205 | 118 |
| 44 | 2 C | Meiobenthos               | proboscis worms            | 0.0001 | 118 |
| 44 | 2 C | other fish                | bony fishes                | 0.0487 | 118 |
| 44 | 2 C | other fish                | unid fish                  | 0.0932 | 118 |
| 44 | 2 C | predatory mesozooplankton | amphipods                  | 0.0001 | 118 |
| 44 | 2 C | predatory mesozooplankton | decapods                   | 0.0263 | 118 |
| 44 | 2 C | predatory mesozooplankton | hyperid amphipods          | 0.0000 | 118 |
| 44 | 2 C | shallowwater benthic fish | pacific tomcod             | 0.0125 | 118 |
| 44 | 2 C | shallowwater benthic fish | sculpins                   | 0.0123 | 118 |
| 44 | 2 C | Shrimp                    | shrimp                     | 0.0021 | 118 |
| 44 | 2 C | Squid                     | squid                      | 0.0178 | 118 |



|    |     |                         |                   |        |    |
|----|-----|-------------------------|-------------------|--------|----|
| 44 | 2 D | Euphausiids             | euphausiids       | 0.0042 | 2  |
| 44 | 2 D | Macrobenthos            | anomurans         | 0.1990 | 2  |
| 44 | 2 D | Macrobenthos            | crabs             | 0.2015 | 2  |
| 44 | 2 D | Macrobenthos            | echiurans         | 0.5939 | 2  |
| 44 | 2 D | other fish              | bony fishes       | 0.0013 | 2  |
|    |     |                         | crabs,shrimps and |        | 7  |
| 44 | 3 A | Macrobenthos            | lobsters          | 0.0018 |    |
| 44 | 3 A | Meiobenthos             | annelids          | 0.0054 | 7  |
| 44 | 3 A | Meiobenthos             | proboscis worms   | 0.0097 | 7  |
| 44 | 3 A | other fish              | bony fishes       | 0.2669 | 7  |
| 44 | 3 A | other flatfish          | flatfishes        | 0.1192 | 7  |
| 44 | 3 A | Ratfish                 | ratfish           | 0.5963 | 7  |
| 44 | 3 A | Shrimp                  | shrimp            | 0.0008 | 7  |
| 44 | 3 C | Herring                 | herring           | 0.4757 | 35 |
| 44 | 3 C | Macrobenthos            | crabs             | 0.0005 | 35 |
|    |     |                         | crustacea with    |        | 35 |
| 44 | 3 C | Macrobenthos            | mandibles         | 0.0001 |    |
| 44 | 3 C | Meiobenthos             | nematodes         | 0.0013 | 35 |
| 44 | 3 C | other fish              | bony fishes       | 0.4143 | 35 |
| 44 | 3 C | other flatfish          | dabs              | 0.0279 | 35 |
| 44 | 3 C | other flatfish          | flatfishes        | 0.0124 | 35 |
| 44 | 3 C | predatory invertebrates | cephalopods       | 0.0102 | 35 |
| 44 | 3 C | predatory invertebrates | octopus           | 0.0112 | 35 |
| 44 | 3 C | Shrimp                  | shrimp            | 0.0000 | 35 |
| 44 | 3 C | Squid                   | squid             | 0.0464 | 35 |
| 44 | 4 A | forage fish             | sandlance         | 0.0010 | 7  |
| 44 | 4 A | Macrobenthos            | anomurans         | 0.0040 | 7  |
| 44 | 4 A | Macrobenthos            | crabs             | 0.0451 | 7  |
| 44 | 4 A | other fish              | bony fishes       | 0.9499 | 7  |
| 44 | 4 B | english sole            | english sole      | 0.0336 | 34 |
| 44 | 4 B | Euphausiids             | euphausiids       | 0.0158 | 34 |
| 44 | 4 B | forage fish             | sandlance         | 0.3872 | 34 |
| 44 | 4 B | Macrobenthos            | anomurans         | 0.0742 | 34 |
| 44 | 4 B | Macrobenthos            | bivalves          | 0.0046 | 34 |
| 44 | 4 B | Macrobenthos            | crabs             | 0.2354 | 34 |
|    |     |                         | crabs,shrimps and |        | 34 |
| 44 | 4 B | Macrobenthos            | lobsters          | 0.0409 |    |
|    |     |                         | crustacea with    |        | 34 |
| 44 | 4 B | Macrobenthos            | mandibles         | 0.0065 |    |
| 44 | 4 B | Meiobenthos             | annelids          | 0.0300 | 34 |
| 44 | 4 B | other fish              | bony fishes       | 0.1233 | 34 |
|    |     | predatory               |                   |        | 34 |
| 44 | 4 B | mesozooplankton         | decapods          | 0.0470 |    |
| 44 | 4 B | Shrimp                  | shrimp            | 0.0016 | 34 |
| 44 | 4 C | Herring                 | herring           | 0.1742 | 5  |
|    |     |                         | crabs,shrimps and |        | 5  |
| 44 | 4 C | Macrobenthos            | lobsters          | 0.0334 |    |
| 44 | 4 C | other fish              | bony fishes       | 0.1688 | 5  |

|    |    |                           |                          |        |     |
|----|----|---------------------------|--------------------------|--------|-----|
| 44 | 4C | Salmon                    | salmon                   | 0.6236 | 5   |
| 44 | 4D | Euphausiids               | euphausiids              | 0.2411 | 3   |
| 44 | 4D | Macrobenthos              | crabs                    | 0.0073 | 3   |
| 44 | 4D | other fish                | bony fishes              | 0.7516 | 1   |
| 56 | 1C | Macrobenthos              | crustacea with mandibles | 0.5745 | 1   |
| 56 | 1C | predatory mesozooplankton | cumaceans                | 0.1064 | 1   |
| 56 | 1C | predatory mesozooplankton | gammarids                | 0.2128 | 1   |
| 56 | 1C | Shrimp                    | shrimp                   | 0.1064 | 1   |
| 56 | 2A | Meiobenthos               | annelids                 | 0.0015 | 2   |
| 56 | 2A | other fish                | unid fish                | 0.4141 | 2   |
| 56 | 2A | Shrimp                    | shrimp                   | 0.5844 | 2   |
| 56 | 2B | forage fish               | sandlance                | 0.1915 | 110 |
| 56 | 2B | jellies/macrozooplankton  | medusae                  | 0.0000 | 110 |
| 56 | 2B | Macrobenthos              | anomurans                | 0.0615 | 110 |
| 56 | 2B | Macrobenthos              | bivalves                 | 0.0111 | 110 |
| 56 | 2B | Macrobenthos              | crabs                    | 0.6039 | 110 |
| 56 | 2B | Macrobenthos              | crustacea with mandibles | 0.0030 | 110 |
| 56 | 2B | Macrobenthos              | gastropods               | 0.0005 | 110 |
| 56 | 2B | Meiobenthos               | annelids                 | 0.0001 | 110 |
| 56 | 2B | Meiobenthos               | nematodes                | 0.0002 | 110 |
| 56 | 2B | other fish                | bony fishes              | 0.0764 | 110 |
| 56 | 2B | other flatfish            | dabs                     | 0.0164 | 110 |
| 56 | 2B | other flatfish            | flatfishes               | 0.0029 | 110 |
| 56 | 2B | other flatfish            | sand sole                | 0.0131 | 110 |
| 56 | 2B | rock sole                 | rock sole                | 0.0009 | 110 |
| 56 | 2B | shallowwater benthic fish | sandfishes               | 0.0045 | 110 |
| 56 | 2B | Shrimp                    | shrimp                   | 0.0140 | 110 |
| 56 | 2D | Macrobenthos              | bivalves                 | 0.0289 | 1   |
| 56 | 2D | Macrobenthos              | crabs                    | 0.9327 | 1   |
| 56 | 2D | Shrimp                    | shrimp                   | 0.0383 | 1   |
| 56 | 3A | Macrobenthos              | crabs                    | 0.8760 | 5   |
| 56 | 3A | Meiobenthos               | annelids                 | 0.0001 | 5   |
| 56 | 3A | other fish                | bony fishes              | 0.0157 | 5   |
| 56 | 3A | other flatfish            | flatfishes               | 0.0641 | 5   |
| 56 | 3A | predatory invertebrates   | octopus                  | 0.0442 | 5   |
| 56 | 3D | Macrobenthos              | anomurans                | 0.0213 | 15  |
| 56 | 3D | Macrobenthos              | crabs                    | 0.0029 | 15  |
| 56 | 3D | Macrobenthos              | crustacea with mandibles | 0.0028 | 15  |
| 56 | 3D | other fish                | bony fishes              | 0.2370 | 15  |
| 56 | 3D | other flatfish            | dabs                     | 0.1794 | 15  |
| 56 | 3D | other flatfish            | flatfishes               | 0.2312 | 15  |
| 56 | 3D | predatory invertebrates   | octopus                  | 0.1569 | 15  |
| 56 | 3D | predatory                 | decapods                 | 0.0153 | 15  |

|    |     |                           |                |        |    |
|----|-----|---------------------------|----------------|--------|----|
|    |     | mesozooplankton           |                |        |    |
| 56 | 3 D | Squid                     | squid          | 0.1533 | 15 |
| 58 | 1 A | Epibenthos                | isopods        | 0.0345 | 24 |
| 58 | 1 A | Epibenthos                | mysids         | 0.0069 | 24 |
| 58 | 1 A | Euphausiids               | euphausiids    | 0.0014 | 24 |
| 58 | 1 A | Macrobenthos              | anomurans      | 0.1798 | 24 |
| 58 | 1 A | Macrobenthos              | crabs          | 0.1528 | 24 |
|    |     |                           | crustacea with |        |    |
| 58 | 1 A | Macrobenthos              | mandibles      | 0.0467 | 24 |
| 58 | 1 A | Meiobenthos               | annelids       | 0.1404 | 24 |
|    |     | predatory                 |                |        |    |
| 58 | 1 A | mesozooplankton           | cumaceans      | 0.0060 | 24 |
|    |     | predatory                 |                |        |    |
| 58 | 1 A | mesozooplankton           | gammarids      | 0.0624 | 24 |
| 58 | 1 A | shallowwater benthic fish | pricklebacks   | 0.0008 | 24 |
| 58 | 1 A | Shrimp                    | shrimp         | 0.3684 | 24 |
|    |     |                           | crustacea with |        |    |
| 58 | 1 C | Macrobenthos              | mandibles      | 0.4336 | 3  |
|    |     | predatory                 |                |        |    |
| 58 | 1 C | mesozooplankton           | gammarids      | 0.4965 | 3  |
| 58 | 1 C | Shrimp                    | shrimp         | 0.0699 | 3  |
| 58 | 2 A | Shrimp                    | shrimp         | 1.0000 | 1  |
| 58 | 2 C | Epibenthos                | mysids         | 0.0089 | 2  |
|    |     |                           | crustacea with |        |    |
| 58 | 2 C | Macrobenthos              | mandibles      | 0.3336 | 2  |
| 58 | 2 C | Meiobenthos               | annelids       | 0.0266 | 2  |
| 58 | 2 C | shallowwater benthic fish | agonidae       | 0.0326 | 2  |
| 58 | 2 C | Shrimp                    | shrimp         | 0.5984 | 2  |
| 58 | 3 A | Macrobenthos              | crabs          | 0.8337 | 2  |
| 58 | 3 A | Shrimp                    | shrimp         | 0.1663 | 2  |
| 59 | 1 A | Shrimp                    | shrimp         | 1.0000 | 1  |
| 59 | 1 B | forage fish               | sandlance      | 0.0848 | 20 |
| 59 | 1 B | Macrobenthos              | anomurans      | 0.0614 | 20 |
| 59 | 1 B | Macrobenthos              | bivalves       | 0.0004 | 20 |
| 59 | 1 B | Macrobenthos              | crabs          | 0.6112 | 20 |
| 59 | 1 B | Macrobenthos              | gastropods     | 0.0213 | 20 |
| 59 | 1 B | Macrobenthos              | reptantia      | 0.0701 | 20 |
| 59 | 1 B | other fish                | unid fish      | 0.0104 | 20 |
| 59 | 1 B | other flatfish            | flatfishes     | 0.1006 | 20 |
| 59 | 1 B | shallowwater benthic fish | sculpins       | 0.0125 | 20 |
| 59 | 1 B | Shrimp                    | shrimp         | 0.0274 | 20 |
| 59 | 1 C | Macrobenthos              | crabs          | 0.1846 | 3  |
| 59 | 1 C | Macrobenthos              | reptantia      | 0.6381 | 3  |
| 59 | 1 C | Shrimp                    | shrimp         | 0.1773 | 3  |
| 59 | 2 A | other flatfish            | flatfishes     | 0.6986 | 1  |
| 59 | 2 A | Shrimp                    | shrimp         | 0.3014 | 1  |
| 59 | 2 C | Epibenthos                | mysids         | 0.0009 | 5  |
| 59 | 2 C | Macrobenthos              | crabs          | 0.0163 | 5  |

|    |     |                           |                            |        |     |
|----|-----|---------------------------|----------------------------|--------|-----|
| 59 | 2 C | Macrobenthos              | crustacea with mandibles   | 0.1061 | 5   |
| 59 | 2 C | Shrimp                    | shrimp                     | 0.8766 | 5   |
| 66 | 1 A | Epibenthos                | isopods                    | 0.0134 | 107 |
| 66 | 1 A | Euphausiids               | euphausiids                | 0.0017 | 107 |
| 66 | 1 A | Macrobenthos              | anomurans                  | 0.1149 | 107 |
| 66 | 1 A | Macrobenthos              | bivalves                   | 0.1749 | 107 |
| 66 | 1 A | Macrobenthos              | crabs                      | 0.0607 | 107 |
| 66 | 1 A | Macrobenthos              | crabs,shrimps and lobsters | 0.0009 | 107 |
| 66 | 1 A | Macrobenthos              | crustacea with mandibles   | 0.1668 | 107 |
| 66 | 1 A | Macrobenthos              | echinoderms                | 0.1724 | 107 |
| 66 | 1 A | Macrobenthos              | gastropods                 | 0.0414 | 107 |
| 66 | 1 A | Meiobenthos               | annelids                   | 0.1610 | 107 |
| 66 | 1 A | Meiobenthos               | nudibranchs                | 0.0006 | 107 |
| 66 | 1 A | other fish                | unid fish                  | 0.0051 | 107 |
| 66 | 1 A | predatory mesozooplankton | amphipods                  | 0.0033 | 107 |
| 66 | 1 A | predatory mesozooplankton | cumaceans                  | 0.0007 | 107 |
| 66 | 1 A | predatory mesozooplankton | decapods                   | 0.0629 | 107 |
| 66 | 1 A | predatory mesozooplankton | gammarids                  | 0.0120 | 107 |
| 66 | 1 A | Shrimp                    | shrimp                     | 0.0074 | 107 |
| 66 | 1 C | Epibenthos                | barnacles                  | 0.0054 | 81  |
| 66 | 1 C | Epibenthos                | isopods                    | 0.0000 | 81  |
| 66 | 1 C | Macrobenthos              | anomurans                  | 0.0180 | 81  |
| 66 | 1 C | Macrobenthos              | bivalves                   | 0.0068 | 81  |
| 66 | 1 C | Macrobenthos              | crabs                      | 0.0537 | 81  |
| 66 | 1 C | Macrobenthos              | crabs,shrimps and lobsters | 0.0146 | 81  |
| 66 | 1 C | Macrobenthos              | crustacea with mandibles   | 0.3412 | 81  |
| 66 | 1 C | Macrobenthos              | echinoderms                | 0.1732 | 81  |
| 66 | 1 C | Macrobenthos              | gastropods                 | 0.0770 | 81  |
| 66 | 1 C | Macrobenthos              | peanut worms               | 0.0094 | 81  |
| 66 | 1 C | Meiobenthos               | annelids                   | 0.1716 | 81  |
| 66 | 1 C | other fish                | bony fishes                | 0.0039 | 81  |
| 66 | 1 C | other fish                | unid fish                  | 0.0034 | 81  |
| 66 | 1 C | predatory mesozooplankton | amphipods                  | 0.0388 | 81  |
| 66 | 1 C | predatory mesozooplankton | decapods                   | 0.0757 | 81  |
| 66 | 1 C | predatory mesozooplankton | gammarids                  | 0.0018 | 81  |
| 66 | 1 C | Shrimp                    | shrimp                     | 0.0056 | 81  |

|    |     |                           |                          |        |     |
|----|-----|---------------------------|--------------------------|--------|-----|
| 66 | 2 C | Epibenthos                | mysids                   | 0.0006 | 70  |
| 66 | 2 C | Euphausiids               | euphausiids              | 0.0071 | 70  |
| 66 | 2 C | Macrobenthos              | anomurans                | 0.4533 | 70  |
| 66 | 2 C | Macrobenthos              | bivalves                 | 0.0415 | 70  |
| 66 | 2 C | Macrobenthos              | crabs                    | 0.1087 | 70  |
| 66 | 2 C | Macrobenthos              | crustacea with mandibles | 0.1000 | 70  |
| 66 | 2 C | Macrobenthos              | echinoderms              | 0.0246 | 70  |
| 66 | 2 C | Macrobenthos              | gastropods               | 0.0136 | 70  |
| 66 | 2 C | Meiobenthos               | annelids                 | 0.1139 | 70  |
| 66 | 2 C | Meiobenthos               | proboscis worms          | 0.0029 | 70  |
| 66 | 2 C | other fish                | bony fishes              | 0.0169 | 70  |
| 66 | 2 C | other fish                | unid fish                | 0.0434 | 70  |
| 66 | 2 C | predatory mesozooplankton | gammarids                | 0.0034 | 70  |
| 66 | 2 C | Shrimp                    | shrimp                   | 0.0700 | 70  |
| 66 | 2 D | Epibenthos                | mysids                   | 0.0199 | 13  |
| 66 | 2 D | Macrobenthos              | anomurans                | 0.0067 | 13  |
| 66 | 2 D | Macrobenthos              | crabs                    | 0.4982 | 13  |
| 66 | 2 D | Macrobenthos              | crustacea with mandibles | 0.2268 | 13  |
| 66 | 2 D | Macrobenthos              | gastropods               | 0.0019 | 13  |
| 66 | 2 D | Meiobenthos               | annelids                 | 0.0113 | 13  |
| 66 | 2 D | predatory mesozooplankton | gammarids                | 0.2327 | 13  |
| 66 | 2 D | predatory mesozooplankton | ostracods                | 0.0001 | 13  |
| 66 | 2 D | Shrimp                    | shrimp                   | 0.0023 | 13  |
| 66 | 3 A | Epibenthos                | barnacles                | 0.0001 | 123 |
| 66 | 3 A | Epibenthos                | isopods                  | 0.0023 | 123 |
| 66 | 3 A | Epibenthos                | mysids                   | 0.0002 | 123 |
| 66 | 3 A | Euphausiids               | euphausiids              | 0.0013 | 123 |
| 66 | 3 A | jellies/macrozooplankton  | medusae                  | 0.0001 | 123 |
| 66 | 3 A | Macrobenthos              | anomurans                | 0.0131 | 123 |
| 66 | 3 A | Macrobenthos              | bivalves                 | 0.5307 | 123 |
| 66 | 3 A | Macrobenthos              | crabs                    | 0.0393 | 123 |
| 66 | 3 A | Macrobenthos              | crustacea with mandibles | 0.0559 | 123 |
| 66 | 3 A | Macrobenthos              | echinoderms              | 0.1088 | 123 |
| 66 | 3 A | Macrobenthos              | echiurans                | 0.0121 | 123 |
| 66 | 3 A | Macrobenthos              | gastropods               | 0.1242 | 123 |
| 66 | 3 A | Meiobenthos               | annelids                 | 0.0196 | 123 |
| 66 | 3 A | Meiobenthos               | proboscis worms          | 0.0073 | 123 |
| 66 | 3 A | other fish                | bony fishes              | 0.0385 | 123 |
| 66 | 3 A | predatory invertebrates   | cephalopods              | 0.0010 | 123 |
| 66 | 3 A | predatory mesozooplankton | amphipods                | 0.0053 | 123 |
| 66 | 3 A | predatory                 | gammarids                | 0.0001 | 123 |



|     |     |                           |                          |        |     |
|-----|-----|---------------------------|--------------------------|--------|-----|
|     |     | mesozooplankton           |                          |        |     |
| 66  | 3 A | Salmon                    | salmon                   | 0.0327 | 123 |
| 66  | 3 A | shallowwater benthic fish | agonidae                 | 0.0007 | 123 |
| 66  | 3 A | Shrimp                    | shrimp                   | 0.0052 | 123 |
| 66  | 3 A | Squid                     | squid                    | 0.0013 | 123 |
| 66  | 3 C | Macrobenthos              | anomurans                | 0.0183 | 34  |
| 66  | 3 C | Macrobenthos              | bivalves                 | 0.1762 | 34  |
| 66  | 3 C | Macrobenthos              | crabs                    | 0.1242 | 34  |
| 66  | 3 C | Macrobenthos              | crustacea with mandibles | 0.0414 | 34  |
| 66  | 3 C | Macrobenthos              | gastropods               | 0.1536 | 34  |
| 66  | 3 C | Meiobenthos               | annelids                 | 0.4499 | 34  |
| 66  | 3 C | Meiobenthos               | proboscis worms          | 0.0033 | 34  |
| 66  | 3 C | other fish                | teleosts                 | 0.0120 | 34  |
| 66  | 3 C | predatory mesozooplankton | amphipods                | 0.0210 | 34  |
| 66  | 3 D | Macrobenthos              | crustacea with mandibles | 0.7023 | 1   |
| 66  | 3 D | other fish                | bony fishes              | 0.1421 | 1   |
| 66  | 3 D | Shrimp                    | shrimp                   | 0.1556 | 1   |
| 148 | 2 D | Euphausiids               | euphausiids              | 0.0166 | 8   |
| 148 | 2 D | Macrobenthos              | crustacea with mandibles | 0.9834 | 8   |
| 148 | 3 A | Euphausiids               | euphausiids              | 1.0000 | 8   |
| 222 | 1 A | Epibenthos                | isopods                  | 0.0011 | 21  |
| 222 | 1 A | Euphausiids               | euphausiids              | 0.0064 | 21  |
| 222 | 1 A | Macrobenthos              | anomurans                | 0.0145 | 21  |
| 222 | 1 A | Macrobenthos              | bivalves                 | 0.0240 | 21  |
| 222 | 1 A | Macrobenthos              | crabs                    | 0.0549 | 21  |
| 222 | 1 A | Macrobenthos              | crustacea with mandibles | 0.1585 | 21  |
| 222 | 1 A | Macrobenthos              | echiurans                | 0.0341 | 21  |
| 222 | 1 A | Macrobenthos              | gastropods               | 0.0032 | 21  |
| 222 | 1 A | Meiobenthos               | annelids                 | 0.0383 | 21  |
| 222 | 1 A | other fish                | unid fish                | 0.2764 | 21  |
| 222 | 1 A | predatory invertebrates   | cephalopods              | 0.0005 | 21  |
| 222 | 1 A | predatory mesozooplankton | cumaceans                | 0.0001 | 21  |
| 222 | 1 A | predatory mesozooplankton | gammarids                | 0.0113 | 21  |
| 222 | 1 A | Shrimp                    | shrimp                   | 0.3768 | 21  |
| 222 | 1 B | forage fish               | sandlance                | 0.8291 | 1   |
| 222 | 1 B | Macrobenthos              | crabs                    | 0.1322 | 1   |
| 222 | 1 B | Meiobenthos               | annelids                 | 0.0103 | 1   |
| 222 | 1 B | Shrimp                    | shrimp                   | 0.0284 | 1   |
| 222 | 1 C | forage fish               | sandlance                | 0.0405 | 44  |
| 222 | 1 C | inshore rockfish          | rockfish                 | 0.0102 | 44  |
| 222 | 1 C | Macrobenthos              | anomurans                | 0.0080 | 44  |

|     |    |                           |                     |        |     |
|-----|----|---------------------------|---------------------|--------|-----|
| 222 | 1C | Macrobenthos              | bivalves            | 0.0019 | 44  |
|     |    |                           | crustacea with      |        |     |
| 222 | 1C | Macrobenthos              | mandibles           | 0.0143 | 44  |
| 222 | 1C | Macrobenthos              | gastropods          | 0.0034 | 44  |
| 222 | 1C | Meiobenthos               | annelids            | 0.0359 | 44  |
| 222 | 1C | other fish                | unid fish           | 0.3967 | 44  |
| 222 | 1C | other flatfish            | flatfishes          | 0.0090 | 44  |
| 222 | 1C | pacific ocean perch       | pacific ocean perch | 0.1196 | 44  |
| 222 | 1C | predatory invertebrates   | cephalopods         | 0.0004 | 44  |
|     |    | predatory                 |                     |        |     |
| 222 | 1C | mesozooplankton           | amphipods           | 0.0001 | 44  |
|     |    | predatory                 |                     |        |     |
| 222 | 1C | mesozooplankton           | gammarids           | 0.0085 | 44  |
| 222 | 1C | shallowwater benthic fish | pholididae          | 0.0026 | 44  |
| 222 | 1C | Shrimp                    | shrimp              | 0.3490 | 44  |
| 222 | 2A | Epibenthos                | mysids              | 0.0004 | 126 |
| 222 | 2A | Euphausiids               | euphausiids         | 0.0010 | 126 |
| 222 | 2A | forage fish               | sandlance           | 0.7655 | 126 |
| 222 | 2A | Herring                   | herring             | 0.0074 | 126 |
| 222 | 2A | Macrobenthos              | bivalves            | 0.0002 | 126 |
| 222 | 2A | Macrobenthos              | crabs               | 0.0005 | 126 |
|     |    |                           | crustacea with      |        |     |
| 222 | 2A | Macrobenthos              | mandibles           | 0.0010 | 126 |
| 222 | 2A | Macrobenthos              | echiurans           | 0.0045 | 126 |
| 222 | 2A | Macrobenthos              | gastropods          | 0.0169 | 126 |
| 222 | 2A | Meiobenthos               | annelids            | 0.0004 | 126 |
| 222 | 2A | other fish                | unid fish           | 0.0316 | 126 |
| 222 | 2A | other flatfish            | flatfishes          | 0.0502 | 126 |
|     |    | predatory                 |                     |        |     |
| 222 | 2A | mesozooplankton           | gammarids           | 0.0030 | 126 |
| 222 | 2A | shallowwater benthic fish | greenling           | 0.0167 | 126 |
| 222 | 2A | Shrimp                    | shrimp              | 0.0920 | 126 |
| 222 | 2A | walleye pollock           | walleye pollock     | 0.0088 | 126 |
| 222 | 2B | Epibenthos                | barnacles           | 0.0097 | 62  |
| 222 | 2B | Epibenthos                | isopods             | 0.0020 | 62  |
| 222 | 2B | Epibenthos                | mysids              | 0.0014 | 62  |
| 222 | 2B | forage fish               | sandlance           | 0.2294 | 62  |
| 222 | 2B | Macrobenthos              | anomurans           | 0.0267 | 62  |
| 222 | 2B | Macrobenthos              | bivalves            | 0.0086 | 62  |
| 222 | 2B | Macrobenthos              | crabs               | 0.0813 | 62  |
|     |    |                           | crustacea with      |        |     |
| 222 | 2B | Macrobenthos              | mandibles           | 0.1383 | 62  |
| 222 | 2B | Macrobenthos              | gastropods          | 0.0019 | 62  |
| 222 | 2B | Macrobenthos              | molluscs            | 0.0077 | 62  |
| 222 | 2B | Meiobenthos               | annelids            | 0.0011 | 62  |
| 222 | 2B | other fish                | unid fish           | 0.1171 | 62  |
| 222 | 2B | other flatfish            | flatfishes          | 0.0123 | 62  |
| 222 | 2B | predatory                 | gammarids           | 0.0754 | 62  |



|     |    |                           |                 |        |    |
|-----|----|---------------------------|-----------------|--------|----|
|     |    | mesozooplankton           |                 |        |    |
| 222 | 2B | Shrimp                    | shrimp          | 0.2871 | 62 |
| 222 | 2C | Euphausiids               | euphausiids     | 0.0205 | 4  |
| 222 | 2C | Macrobenthos              | crabs           | 0.0078 | 4  |
| 222 | 2C | Meiobenthos               | annelids        | 0.0036 | 4  |
| 222 | 2C | shallowwater benthic fish | pholididae      | 0.3681 | 4  |
| 222 | 2C | Shrimp                    | shrimp          | 0.6000 | 4  |
| 222 | 2D | Epibenthos                | mysids          | 0.0034 | 42 |
| 222 | 2D | Euphausiids               | euphausiids     | 0.0001 | 42 |
| 222 | 2D | Herring                   | herring         | 0.0582 | 42 |
| 222 | 2D | Macrobenthos              | bivalves        | 0.0006 | 42 |
| 222 | 2D | Macrobenthos              | crabs           | 0.0002 | 42 |
|     |    |                           | crustacea with  |        |    |
| 222 | 2D | Macrobenthos              | mandibles       | 0.0014 | 42 |
| 222 | 2D | Macrobenthos              | echiurans       | 0.0013 | 42 |
| 222 | 2D | Macrobenthos              | gastropods      | 0.0009 | 42 |
| 222 | 2D | other fish                | unid fish       | 0.2145 | 42 |
| 222 | 2D | other flatfish            | flatfishes      | 0.4549 | 42 |
| 222 | 2D | predatory invertebrates   | cephalopods     | 0.0001 | 42 |
|     |    | predatory                 |                 |        |    |
| 222 | 2D | mesozooplankton           | gammarids       | 0.0002 | 42 |
| 222 | 2D | shallowwater benthic fish | agonidae        | 0.0143 | 42 |
| 222 | 2D | Shrimp                    | shrimp          | 0.0294 | 42 |
| 222 | 2D | Squid                     | squid           | 0.0219 | 42 |
| 222 | 2D | Turbot                    | turbot          | 0.0270 | 42 |
| 222 | 2D | walleye pollock           | walleye pollock | 0.1717 | 42 |
| 222 | 3A | Epibenthos                | isopods         | 0.0001 | 38 |
| 222 | 3A | Epibenthos                | mysids          | 0.0002 | 38 |
| 222 | 3A | Euphausiids               | euphausiids     | 0.0094 | 38 |
| 222 | 3A | jellies/macrozooplankton  | medusae         | 0.0002 | 38 |
| 222 | 3A | Macrobenthos              | anomurans       | 0.0007 | 38 |
| 222 | 3A | Macrobenthos              | bivalves        | 0.0002 | 38 |
| 222 | 3A | Macrobenthos              | cnidaria        | 0.0000 | 38 |
| 222 | 3A | Macrobenthos              | crabs           | 0.2811 | 38 |
|     |    |                           | crustacea with  |        |    |
| 222 | 3A | Macrobenthos              | mandibles       | 0.1195 | 38 |
| 222 | 3A | Macrobenthos              | gastropods      | 0.0013 | 38 |
| 222 | 3A | Meiobenthos               | annelids        | 0.0343 | 38 |
| 222 | 3A | Meiobenthos               | nematodes       | 0.0059 | 38 |
| 222 | 3A | other fish                | bony fishes     | 0.3508 | 38 |
| 222 | 3A | other flatfish            | dabs            | 0.0096 | 38 |
| 222 | 3A | other flatfish            | flatfishes      | 0.0113 | 38 |
|     |    | predatory                 |                 |        |    |
| 222 | 3A | mesozooplankton           | amphipods       | 0.0039 | 38 |
|     |    | predatory                 |                 |        |    |
| 222 | 3A | mesozooplankton           | gammarids       | 0.0027 | 38 |
| 222 | 3A | Shrimp                    | shrimp          | 0.1248 | 38 |
| 222 | 3A | walleye pollock           | walleye pollock | 0.0440 | 38 |

|     |     |                           |                          |        |    |
|-----|-----|---------------------------|--------------------------|--------|----|
| 222 | 3 B | forage fish               | sandlance                | 0.3984 | 4  |
| 222 | 3 B | Macrobenthos              | crabs                    | 0.0107 | 4  |
| 222 | 3 B | Macrobenthos              | crustacea with mandibles | 0.1457 | 4  |
| 222 | 3 B | Meiobenthos               | annelids                 | 0.0203 | 4  |
| 222 | 3 B | other fish                | bony fishes              | 0.2341 | 4  |
| 222 | 3 B | predatory mesozooplankton | amphipods                | 0.0554 | 4  |
| 222 | 3 B | Shrimp                    | shrimp                   | 0.1354 | 4  |
| 222 | 3 C | Herring                   | herring                  | 0.6182 | 79 |
| 222 | 3 C | Macrobenthos              | bivalves                 | 0.0001 | 79 |
| 222 | 3 C | Macrobenthos              | crabs                    | 0.0121 | 79 |
| 222 | 3 C | Macrobenthos              | crustacea with mandibles | 0.0048 | 79 |
| 222 | 3 C | Macrobenthos              | echinoderms              | 0.0003 | 79 |
| 222 | 3 C | Macrobenthos              | gastropods               | 0.0001 | 79 |
| 222 | 3 C | Macrobenthos              | sponges                  | 0.0035 | 79 |
| 222 | 3 C | Meiobenthos               | annelids                 | 0.0016 | 79 |
| 222 | 3 C | Meiobenthos               | nematodes                | 0.0048 | 79 |
| 222 | 3 C | Microzooplankton          | protozoa                 | 0.0000 | 79 |
| 222 | 3 C | other fish                | bony fishes              | 0.1537 | 79 |
| 222 | 3 C | other flatfish            | dabs                     | 0.0514 | 79 |
| 222 | 3 C | pacific cod               | pacific cod              | 0.0278 | 79 |
| 222 | 3 C | predatory invertebrates   | cephalopods              | 0.0322 | 79 |
| 222 | 3 C | predatory mesozooplankton | amphipods                | 0.0008 | 79 |
| 222 | 3 C | predatory mesozooplankton | decapods                 | 0.0001 | 79 |
| 222 | 3 C | predatory mesozooplankton | gammarids                | 0.0003 | 79 |
| 222 | 3 C | shallowwater benthic fish | agonidae                 | 0.0032 | 79 |
| 222 | 3 C | Shrimp                    | shrimp                   | 0.0549 | 79 |
| 222 | 3 C | Squid                     | squid                    | 0.0301 | 79 |
| 222 | 3 D | Epibenthos                | isopods                  | 0.0050 | 53 |
| 222 | 3 D | Epibenthos                | mysids                   | 0.0028 | 53 |
| 222 | 3 D | Macrobenthos              | anomurans                | 0.0176 | 53 |
| 222 | 3 D | Macrobenthos              | crabs                    | 0.3632 | 53 |
| 222 | 3 D | Macrobenthos              | crustacea                | 0.0011 | 53 |
| 222 | 3 D | Macrobenthos              | crustacea with mandibles | 0.3144 | 53 |
| 222 | 3 D | Macrobenthos              | gastropods               | 0.0069 | 53 |
| 222 | 3 D | Meiobenthos               | annelids                 | 0.0753 | 53 |
| 222 | 3 D | Other                     | tussock moths            | 0.0879 | 53 |
| 222 | 3 D | other fish                | bony fishes              | 0.0303 | 53 |
| 222 | 3 D | other fish                | teleosts                 | 0.0062 | 53 |
| 222 | 3 D | predatory mesozooplankton | amphipods                | 0.0231 | 53 |
| 222 | 3 D | predatory                 | decapods                 | 0.0098 | 53 |

|     |     |                           |                   |        |    |
|-----|-----|---------------------------|-------------------|--------|----|
|     |     | mesozooplankton           |                   |        |    |
|     |     | predatory                 |                   |        |    |
| 222 | 3 D | mesozooplankton           | gammarids         | 0.0052 | 53 |
| 222 | 3 D | shallowwater benthic fish | agonidae          | 0.0337 | 53 |
| 222 | 3 D | Shrimp                    | shrimp            | 0.0173 | 53 |
| 222 | 3 E | Euphausiids               | euphausiids       | 0.0006 | 60 |
| 222 | 3 E | inshore rockfish          | rockfish          | 0.1820 | 60 |
| 222 | 3 E | Macrobenthos              | anomurans         | 0.0047 | 60 |
| 222 | 3 E | Macrobenthos              | bivalves          | 0.0000 | 60 |
| 222 | 3 E | Macrobenthos              | crabs             | 0.0322 | 60 |
|     |     |                           | crustacea with    |        |    |
| 222 | 3 E | Macrobenthos              | mandibles         | 0.0102 | 60 |
| 222 | 3 E | Meiobenthos               | annelids          | 0.0259 | 60 |
| 222 | 3 E | Meiobenthos               | nematodes         | 0.0026 | 60 |
| 222 | 3 E | other fish                | bony fishes       | 0.5359 | 60 |
|     |     | predatory                 |                   |        |    |
| 222 | 3 E | mesozooplankton           | amphipods         | 0.0135 | 60 |
|     |     | predatory                 |                   |        |    |
| 222 | 3 E | mesozooplankton           | gammarids         | 0.0042 | 60 |
| 222 | 3 E | shallowwater benthic fish | agonidae          | 0.0158 | 60 |
| 222 | 3 E | shallowwater benthic fish | perch             | 0.0945 | 60 |
| 222 | 3 E | shallowwater benthic fish | pricklebacks      | 0.0216 | 60 |
| 222 | 3 E | shallowwater benthic fish | sculpins          | 0.0378 | 60 |
| 222 | 3 E | Shrimp                    | shrimp            | 0.0183 | 60 |
| 222 | 4 A | Euphausiids               | euphausiids       | 0.1278 | 2  |
| 222 | 4 A | forage fish               | sandlance         | 0.1652 | 2  |
| 222 | 4 A | Macrobenthos              | gastropods        | 0.0053 | 2  |
| 222 | 4 A | Meiobenthos               | annelids          | 0.1194 | 2  |
| 222 | 4 A | Meiobenthos               | nematodes         | 0.0256 | 2  |
| 222 | 4 A | other fish                | bony fishes       | 0.5567 | 2  |
| 222 | 4 B | Epibenthos                | barnacles         | 0.0000 | 28 |
| 222 | 4 B | forage fish               | sandlance         | 0.2246 | 28 |
| 222 | 4 B | Macrobenthos              | anomurans         | 0.0826 | 28 |
| 222 | 4 B | Macrobenthos              | bivalves          | 0.0069 | 28 |
| 222 | 4 B | Macrobenthos              | cnidaria          | 0.0001 | 28 |
| 222 | 4 B | Macrobenthos              | crabs             | 0.1587 | 28 |
|     |     |                           | crabs,shrimps and |        |    |
| 222 | 4 B | Macrobenthos              | lobsters          | 0.0466 | 28 |
|     |     |                           | crustacea with    |        |    |
| 222 | 4 B | Macrobenthos              | mandibles         | 0.0538 | 28 |
| 222 | 4 B | Macrobenthos              | gastropods        | 0.0002 | 28 |
| 222 | 4 B | Meiobenthos               | annelids          | 0.0127 | 28 |
| 222 | 4 B | Meiobenthos               | nematodes         | 0.0043 | 28 |
| 222 | 4 B | Meiobenthos               | proboscis worms   | 0.0003 | 28 |
| 222 | 4 B | other fish                | bony fishes       | 0.2940 | 28 |
| 222 | 4 B | other flatfish            | flatfishes        | 0.0517 | 28 |
|     |     | predatory                 |                   |        |    |
| 222 | 4 B | mesozooplankton           | amphipods         | 0.0001 | 28 |

|     |     |                           |                             |        |     |
|-----|-----|---------------------------|-----------------------------|--------|-----|
| 222 | 4 B | predatory mesozooplankton | decapods                    | 0.0133 | 28  |
| 222 | 4 B | predatory mesozooplankton | gammarids                   | 0.0001 | 28  |
| 222 | 4 B | Shrimp                    | shrimp                      | 0.0501 | 28  |
| 222 | 4 C | Copepods                  | copepods                    | 0.0001 | 46  |
| 222 | 4 C | Euphausiids               | euphausiids                 | 0.0002 | 46  |
| 222 | 4 C | inshore rockfish          | rockfish                    | 0.0112 | 46  |
| 222 | 4 C | Macrobenthos              | anomurans                   | 0.1427 | 46  |
| 222 | 4 C | Macrobenthos              | bivalves                    | 0.0001 | 46  |
| 222 | 4 C | Macrobenthos              | crabs                       | 0.0327 | 46  |
| 222 | 4 C | Macrobenthos              | crabs, shrimps and lobsters | 0.0054 | 46  |
| 222 | 4 C | Macrobenthos              | crustacea with mandibles    | 0.0258 | 46  |
| 222 | 4 C | Macrobenthos              | echinoderms                 | 0.0001 | 46  |
| 222 | 4 C | Macrobenthos              | gastropods                  | 0.0061 | 46  |
| 222 | 4 C | Macrobenthos              | peanut worms                | 0.0008 | 46  |
| 222 | 4 C | Meiobenthos               | annelids                    | 0.0922 | 46  |
| 222 | 4 C | Meiobenthos               | nematodes                   | 0.0093 | 46  |
| 222 | 4 C | other fish                | bony fishes                 | 0.6436 | 46  |
| 222 | 4 C | predatory invertebrates   | cephalopods                 | 0.0029 | 46  |
| 222 | 4 C | predatory mesozooplankton | amphipods                   | 0.0001 | 46  |
| 222 | 4 C | predatory mesozooplankton | cumaceans                   | 0.0005 | 46  |
| 222 | 4 C | predatory mesozooplankton | decapods                    | 0.0097 | 46  |
| 222 | 4 C | predatory mesozooplankton | gammarids                   | 0.0012 | 46  |
| 222 | 4 C | shallowwater benthic fish | agonidae                    | 0.0130 | 46  |
| 222 | 4 C | Shrimp                    | shrimp                      | 0.0023 | 46  |
| 228 | 1 A | Epibenthos                | mysids                      | 0.0028 | 22  |
| 228 | 1 A | Euphausiids               | euphausiids                 | 0.9330 | 22  |
| 228 | 1 A | Macrobenthos              | crustacea with mandibles    | 0.0046 | 22  |
| 228 | 1 A | other fish                | unid fish                   | 0.0197 | 22  |
| 228 | 1 A | predatory mesozooplankton | cumaceans                   | 0.0004 | 22  |
| 228 | 1 A | predatory mesozooplankton | gammarids                   | 0.0010 | 22  |
| 228 | 1 A | Shrimp                    | shrimp                      | 0.0386 | 22  |
| 228 | 1 B | Shrimp                    | shrimp                      | 1.0000 | 1   |
| 228 | 1 C | Copepods                  | copepods                    | 0.0215 | 110 |
| 228 | 1 C | Epibenthos                | isopods                     | 0.0007 | 110 |
| 228 | 1 C | Epibenthos                | mysids                      | 0.0001 | 110 |
| 228 | 1 C | Euphausiids               | euphausiids                 | 0.0085 | 110 |
| 228 | 1 C | jellies/macrozooplankton  | tunicates                   | 0.0001 | 110 |

|     |     |                           |                   |        |     |
|-----|-----|---------------------------|-------------------|--------|-----|
| 228 | 1 C | Macrobenthos              | anomurans         | 0.0000 | 110 |
| 228 | 1 C | Macrobenthos              | bivalves          | 0.0000 | 110 |
| 228 | 1 C | Macrobenthos              | chaetognaths      | 0.0000 | 110 |
| 228 | 1 C | Macrobenthos              | crabs             | 0.0000 | 110 |
|     |     |                           | crustacea with    |        |     |
| 228 | 1 C | Macrobenthos              | mandibles         | 0.0511 | 110 |
| 228 | 1 C | Macrobenthos              | gastropods        | 0.0096 | 110 |
| 228 | 1 C | Meiobenthos               | annelids          | 0.0036 | 110 |
| 228 | 1 C | other fish                | unid fish         | 0.0288 | 110 |
| 228 | 1 C | predatory invertebrates   | cephalopods       | 0.0004 | 110 |
|     |     | predatory                 |                   |        |     |
| 228 | 1 C | mesozooplankton           | cumaceans         | 0.0002 | 110 |
|     |     | predatory                 |                   |        |     |
| 228 | 1 C | mesozooplankton           | gammarids         | 0.0033 | 110 |
|     |     | predatory                 |                   |        |     |
| 228 | 1 C | mesozooplankton           | hyperid amphipods | 0.0000 | 110 |
| 228 | 1 C | shallowwater benthic fish | sculpins          | 0.0002 | 110 |
| 228 | 1 C | Shrimp                    | shrimp            | 0.8718 | 110 |
| 228 | 2 C | Euphausiids               | euphausiids       | 0.7010 | 4   |
| 228 | 2 C | Macrobenthos              | crabs             | 0.0748 | 4   |
|     |     |                           | crustacea with    |        |     |
| 228 | 2 C | Macrobenthos              | mandibles         | 0.0420 | 4   |
| 228 | 2 C | Meiobenthos               | nematodes         | 0.0080 | 4   |
| 228 | 2 C | other fish                | bony fishes       | 0.0145 | 4   |
| 228 | 2 C | Shrimp                    | shrimp            | 0.1597 | 4   |
| 228 | 2 D | Epibenthos                | mysids            | 0.5308 | 44  |
| 228 | 2 D | Euphausiids               | euphausiids       | 0.2123 | 44  |
| 228 | 2 D | Macrobenthos              | anomurans         | 0.0011 | 44  |
| 228 | 2 D | Macrobenthos              | crabs             | 0.0629 | 44  |
|     |     |                           | crustacea with    |        |     |
| 228 | 2 D | Macrobenthos              | mandibles         | 0.0284 | 44  |
| 228 | 2 D | Meiobenthos               | nematodes         | 0.0028 | 44  |
| 228 | 2 D | other fish                | bony fishes       | 0.1060 | 44  |
|     |     | predatory                 |                   |        |     |
| 228 | 2 D | mesozooplankton           | amphipods         | 0.0001 | 44  |
| 228 | 2 D | Shrimp                    | shrimp            | 0.0555 | 44  |
| 228 | 3 A | Macrobenthos              | crabs             | 0.8008 | 3   |
|     |     |                           | crustacea with    |        |     |
| 228 | 3 A | Macrobenthos              | mandibles         | 0.1992 | 3   |
| 228 | 3 C | Copepods                  | copepods          | 0.0007 | 15  |
| 228 | 3 C | Epibenthos                | isopods           | 0.0004 | 15  |
| 228 | 3 C | Euphausiids               | euphausiids       | 0.0911 | 15  |
| 228 | 3 C | Macrobenthos              | crabs             | 0.2756 | 15  |
|     |     |                           | crustacea with    |        |     |
| 228 | 3 C | Macrobenthos              | mandibles         | 0.0725 | 15  |
|     |     | predatory                 |                   |        |     |
| 228 | 3 C | mesozooplankton           | amphipods         | 0.0004 | 15  |
| 228 | 3 C | predatory                 | hyperid amphipods | 0.0175 | 15  |

|     |     |                         |                   |        |    |
|-----|-----|-------------------------|-------------------|--------|----|
|     |     | mesozooplankton         |                   |        |    |
| 228 | 3 C | Shrimp                  | shrimp            | 0.5417 | 15 |
| 228 | 3 D | Euphausiids             | euphausiids       | 0.0588 | 8  |
| 228 | 3 D | Macrobenthos            | crabs             | 0.3427 | 8  |
|     |     |                         | crustacea with    |        |    |
| 228 | 3 D | Macrobenthos            | mandibles         | 0.4710 | 8  |
| 228 | 3 D | Shrimp                  | shrimp            | 0.1275 | 8  |
| 396 | 1 A | Euphausiids             | euphausiids       | 0.9462 | 5  |
|     |     | predatory               |                   |        |    |
| 396 | 1 A | mesozooplankton         | cumaceans         | 0.0035 | 5  |
|     |     | predatory               |                   |        |    |
| 396 | 1 A | mesozooplankton         | gammarids         | 0.0290 | 5  |
| 396 | 1 A | Shrimp                  | shrimp            | 0.0213 | 5  |
| 396 | 1 C | Copepods                | copepods          | 0.3122 | 64 |
| 396 | 1 C | Epibenthos              | mysids            | 0.0039 | 64 |
| 396 | 1 C | Euphausiids             | euphausiids       | 0.2824 | 64 |
| 396 | 1 C | Macrobenthos            | chaetognaths      | 0.0072 | 64 |
|     |     |                         | crustacea with    |        |    |
| 396 | 1 C | Macrobenthos            | mandibles         | 0.1697 | 64 |
| 396 | 1 C | Macrobenthos            | gastropods        | 0.0942 | 64 |
| 396 | 1 C | other fish              | unid fish         | 0.0623 | 64 |
|     |     | predatory               |                   |        |    |
| 396 | 1 C | mesozooplankton         | amphipods         | 0.0082 | 64 |
|     |     | predatory               |                   |        |    |
| 396 | 1 C | mesozooplankton         | gammarids         | 0.0059 | 64 |
|     |     | predatory               |                   |        |    |
| 396 | 1 C | mesozooplankton         | hyperid amphipods | 0.0093 | 64 |
|     |     | predatory               |                   |        |    |
| 396 | 1 C | mesozooplankton         | megalops          | 0.0031 | 64 |
| 396 | 1 C | Shrimp                  | shrimp            | 0.0416 | 64 |
| 396 | 2 C | Copepods                | copepods          | 0.0002 | 43 |
| 396 | 2 C | Epibenthos              | mysids            | 0.0124 | 43 |
| 396 | 2 C | Euphausiids             | euphausiids       | 0.8854 | 43 |
| 396 | 2 C | Macrobenthos            | crabs             | 0.0882 | 43 |
| 396 | 2 C | Shrimp                  | shrimp            | 0.0138 | 43 |
| 401 | 1 A | Shrimp                  | shrimp            | 1.0000 | 1  |
| 401 | 2 C | Euphausiids             | euphausiids       | 0.0114 | 46 |
| 401 | 2 C | forage fish             | sandlance         | 0.0122 | 46 |
| 401 | 2 C | Macrobenthos            | crabs             | 0.4056 | 46 |
| 401 | 2 C | Meiobenthos             | nematodes         | 0.0484 | 46 |
| 401 | 2 C | other fish              | bony fishes       | 0.1736 | 46 |
| 401 | 2 C | other flatfish          | dabs              | 0.0202 | 46 |
| 401 | 2 C | other flatfish          | slender sole      | 0.0048 | 46 |
| 401 | 2 C | predatory invertebrates | cephalopods       | 0.0314 | 46 |
|     |     | predatory               |                   |        |    |
| 401 | 2 C | mesozooplankton         | amphipods         | 0.0004 | 46 |
|     |     | predatory               |                   |        |    |
| 401 | 2 C | mesozooplankton         | gammarids         | 0.0003 | 46 |



|     |     |                           |                   |        |    |
|-----|-----|---------------------------|-------------------|--------|----|
| 401 | 2 C | shallowwater benthic fish | agonidae          | 0.0056 | 46 |
| 401 | 2 C | shallowwater benthic fish | pricklebacks      | 0.0115 | 46 |
| 401 | 2 C | Shrimp                    | shrimp            | 0.2333 | 46 |
| 401 | 2 C | Squid                     | squid             | 0.0302 | 46 |
| 401 | 2 C | walleye pollock           | walleye pollock   | 0.0111 | 46 |
| 405 | 1 C | Euphausiids               | euphausiids       | 0.3223 | 8  |
| 405 | 1 C | other fish                | unid fish         | 0.6776 | 8  |
|     |     | predatory                 |                   |        |    |
| 405 | 1 C | mesozooplankton           | hyperid amphipods | 0.0001 | 8  |
| 405 | 2 A | jellies/macrozooplankton  | medusae           | 0.0016 | 5  |
| 405 | 2 A | other fish                | bony fishes       | 0.6734 | 5  |
| 405 | 2 A | walleye pollock           | walleye pollock   | 0.3250 | 5  |
| 405 | 2 C | Euphausiids               | euphausiids       | 0.3584 | 25 |
|     |     |                           | crustacea with    |        |    |
| 405 | 2 C | Macrobenthos              | mandibles         | 0.0033 | 25 |
| 405 | 2 C | Meiobenthos               | nematodes         | 0.0003 | 25 |
| 405 | 2 C | other fish                | bony fishes       | 0.1101 | 25 |
| 405 | 2 C | other fish                | unid fish         | 0.4965 | 25 |
| 405 | 2 C | shallowwater benthic fish | smelt             | 0.0028 | 25 |
| 405 | 2 C | walleye pollock           | walleye pollock   | 0.0286 | 25 |
| 414 | 2 C | Euphausiids               | euphausiids       | 0.8223 | 4  |
| 414 | 2 C | Macrobenthos              | crabs             | 0.1115 | 4  |
|     |     |                           | crustacea with    |        |    |
| 414 | 2 C | Macrobenthos              | mandibles         | 0.0080 | 4  |
| 414 | 2 C | other fish                | bony fishes       | 0.0566 | 4  |
|     |     | predatory                 |                   |        |    |
| 414 | 2 C | mesozooplankton           | amphipods         | 0.0005 | 4  |
|     |     | predatory                 |                   |        |    |
| 414 | 2 C | mesozooplankton           | gammarids         | 0.0010 | 4  |
| 418 | 1 A | Copepods                  | copepods          | 0.0000 | 12 |
| 418 | 1 A | Epibenthos                | mysids            | 0.0004 | 12 |
| 418 | 1 A | Euphausiids               | euphausiids       | 0.6025 | 12 |
| 418 | 1 A | forage fish               | sandlance         | 0.0031 | 12 |
| 418 | 1 A | inshore rockfish          | rockfish          | 0.0220 | 12 |
| 418 | 1 A | Lingcod                   | lingcod           | 0.0010 | 12 |
| 418 | 1 A | Macrobenthos              | anomurans         | 0.0000 | 12 |
|     |     |                           | crustacea with    |        |    |
| 418 | 1 A | Macrobenthos              | mandibles         | 0.0372 | 12 |
| 418 | 1 A | Macrobenthos              | gastropods        | 0.1112 | 12 |
| 418 | 1 A | Meiobenthos               | annelids          | 0.0010 | 12 |
| 418 | 1 A | other fish                | unid fish         | 0.0469 | 12 |
| 418 | 1 A | other flatfish            | flatfishes        | 0.0005 | 12 |
|     |     | predatory                 |                   |        |    |
| 418 | 1 A | mesozooplankton           | cumaceans         | 0.0045 | 12 |
|     |     | predatory                 |                   |        |    |
| 418 | 1 A | mesozooplankton           | gammarids         | 0.0025 | 12 |
|     |     | predatory                 |                   |        |    |
| 418 | 1 A | mesozooplankton           | hyperid amphipods | 0.0003 | 12 |



|     |     |                           |                          |        |    |
|-----|-----|---------------------------|--------------------------|--------|----|
| 418 | 1 A | shallowwater benthic fish | sculpins                 | 0.0033 | 12 |
| 418 | 1 A | Shrimp                    | shrimp                   | 0.1636 | 12 |
| 418 | 1 C | Euphausiids               | euphausiids              | 0.0314 | 2  |
| 418 | 1 C | Shrimp                    | shrimp                   | 0.9686 | 2  |
| 418 | 2 C | Epibenthos                | mysids                   | 0.0126 | 26 |
| 418 | 2 C | Euphausiids               | euphausiids              | 0.6452 | 26 |
| 418 | 2 C | forage fish               | sandlance                | 0.0015 | 26 |
| 418 | 2 C | Macrobenthos              | crabs                    | 0.3087 | 26 |
| 418 | 2 C | Meiobenthos               | nematodes                | 0.0025 | 26 |
| 418 | 2 C | other fish                | bony fishes              | 0.0056 | 26 |
| 418 | 2 C | petrale sole              | petrale sole             | 0.0130 | 26 |
| 418 | 2 C | predatory mesozooplankton | hyperid amphipods        | 0.0001 | 26 |
| 418 | 2 C | Shrimp                    | shrimp                   | 0.0109 | 26 |
| 418 | 3 A | Epibenthos                | mysids                   | 0.0004 | 17 |
| 418 | 3 A | Euphausiids               | euphausiids              | 0.8097 | 17 |
| 418 | 3 A | forage fish               | sandlance                | 0.0394 | 17 |
| 418 | 3 A | Macrobenthos              | crabs                    | 0.0292 | 17 |
| 418 | 3 A | Macrobenthos              | crustacea with mandibles | 0.0419 | 17 |
| 418 | 3 A | Macrobenthos              | gastropods               | 0.0173 | 17 |
| 418 | 3 A | Meiobenthos               | annelids                 | 0.0000 | 17 |
| 418 | 3 A | other fish                | bony fishes              | 0.0064 | 17 |
| 418 | 3 A | predatory invertebrates   | cephalopods              | 0.0110 | 17 |
| 418 | 3 A | predatory mesozooplankton | amphipods                | 0.0009 | 17 |
| 418 | 3 A | predatory mesozooplankton | hyperid amphipods        | 0.0002 | 17 |
| 418 | 3 A | Shrimp                    | shrimp                   | 0.0339 | 17 |
| 418 | 3 A | Squid                     | squid                    | 0.0097 | 17 |
| 435 | 1 A | walleye pollock           | walleye pollock          | 1.0000 | 1  |
| 435 | 1 C | other fish                | unid fish                | 1.0000 | 4  |
| 435 | 2 A | Meiobenthos               | nematodes                | 0.0016 | 1  |
| 435 | 2 A | other fish                | bony fishes              | 0.9984 | 1  |
| 435 | 2 C | other fish                | bony fishes              | 1.0000 | 1  |
| 435 | 3 C | Meiobenthos               | nematodes                | 0.0325 | 1  |
| 435 | 3 C | other fish                | bony fishes              | 0.0198 | 1  |
| 435 | 3 C | Turbot                    | turbot                   | 0.9477 | 1  |
| 455 | 1 A | Dogfish                   | dogfish                  | 0.1787 | 42 |
| 455 | 1 A | Dogfish                   | sharks                   | 0.0477 | 42 |
| 455 | 1 A | Epibenthos                | isopods                  | 0.0012 | 42 |
| 455 | 1 A | Euphausiids               | euphausiids              | 0.0860 | 42 |
| 455 | 1 A | Macrobenthos              | anomurans                | 0.0513 | 42 |
| 455 | 1 A | Macrobenthos              | ascidians                | 0.0132 | 42 |
| 455 | 1 A | Macrobenthos              | bivalves                 | 0.0110 | 42 |
| 455 | 1 A | Macrobenthos              | cnidaria                 | 0.0007 | 42 |
| 455 | 1 A | Macrobenthos              | echinoderms              | 0.0185 | 42 |
| 455 | 1 A | Macrobenthos              | echiurans                | 0.0494 | 42 |

|     |     |                           |                          |        |    |
|-----|-----|---------------------------|--------------------------|--------|----|
| 455 | 1 A | Macrobenthos              | gastropods               | 0.1786 | 42 |
| 455 | 1 A | Meiobenthos               | annelids                 | 0.0092 | 42 |
| 455 | 1 A | other fish                | unid fish                | 0.2869 | 42 |
| 455 | 1 A | Phytoplankton             | phytoplankton            | 0.0635 | 42 |
| 455 | 1 A | predatory mesozooplankton | amphipods                | 0.0004 | 42 |
| 455 | 1 A | predatory mesozooplankton | gammarids                | 0.0015 | 42 |
| 455 | 1 A | Shrimp                    | shrimp                   | 0.0021 | 42 |
| 455 | 1 C | Epibenthos                | isopods                  | 0.0014 | 36 |
| 455 | 1 C | Euphausiids               | euphausiids              | 0.0019 | 36 |
| 455 | 1 C | forage fish               | sandlance                | 0.2262 | 36 |
| 455 | 1 C | Macrobenthos              | anomurans                | 0.0139 | 36 |
| 455 | 1 C | Macrobenthos              | cnidaria                 | 0.1166 | 36 |
| 455 | 1 C | Macrobenthos              | crabs                    | 0.0644 | 36 |
| 455 | 1 C | Macrobenthos              | crustacea with mandibles | 0.0025 | 36 |
| 455 | 1 C | Macrobenthos              | echinoderms              | 0.0495 | 36 |
| 455 | 1 C | Macrobenthos              | gastropods               | 0.0725 | 36 |
| 455 | 1 C | Macrobenthos              | reptantia                | 0.0042 | 36 |
| 455 | 1 C | Meiobenthos               | annelids                 | 0.0884 | 36 |
| 455 | 1 C | other fish                | unid fish                | 0.0869 | 36 |
| 455 | 1 C | predatory mesozooplankton | gammarids                | 0.0290 | 36 |
| 455 | 1 C | Shrimp                    | shrimp                   | 0.2053 | 36 |
| 455 | 1 C | Squid                     | squid                    | 0.0373 | 36 |
| 455 | 2 A | Euphausiids               | euphausiids              | 0.0338 | 2  |
| 455 | 2 A | jellies/macrozooplankton  | medusae                  | 0.0196 | 2  |
| 455 | 2 A | Meiobenthos               | annelids                 | 0.5365 | 2  |
| 455 | 2 A | other fish                | bony fishes              | 0.2748 | 2  |
| 455 | 2 A | predatory mesozooplankton | amphipods                | 0.0589 | 2  |
| 455 | 2 A | predatory mesozooplankton | gammarids                | 0.0120 | 2  |
| 455 | 2 A | Shrimp                    | shrimp                   | 0.0643 | 2  |
| 455 | 2 C | Epibenthos                | isopods                  | 0.0003 | 90 |
| 455 | 2 C | Epibenthos                | mysids                   | 0.0000 | 90 |
| 455 | 2 C | Euphausiids               | euphausiids              | 0.7399 | 90 |
| 455 | 2 C | Herring                   | herring                  | 0.0377 | 90 |
| 455 | 2 C | Macrobenthos              | anomurans                | 0.0002 | 90 |
| 455 | 2 C | Macrobenthos              | cnidaria                 | 0.0343 | 90 |
| 455 | 2 C | Macrobenthos              | crabs                    | 0.0026 | 90 |
| 455 | 2 C | Macrobenthos              | crustacea with mandibles | 0.0039 | 90 |
| 455 | 2 C | Macrobenthos              | echinoderms              | 0.0002 | 90 |
| 455 | 2 C | Macrobenthos              | echiurans                | 0.0002 | 90 |
| 455 | 2 C | Macrobenthos              | gastropods               | 0.0001 | 90 |
| 455 | 2 C | Meiobenthos               | annelids                 | 0.0012 | 90 |

|     |    |                           |                   |        |    |
|-----|----|---------------------------|-------------------|--------|----|
| 455 | 2C | other fish                | bony fishes       | 0.0024 | 90 |
| 455 | 2C | other fish                | unid fish         | 0.1444 | 90 |
| 455 | 2C | Phytoplankton             | phytoplankton     | 0.0013 | 90 |
| 455 | 2C | predatory mesozooplankton | amphipods         | 0.0002 | 90 |
| 455 | 2C | predatory mesozooplankton | gammarids         | 0.0001 | 90 |
| 455 | 2C | predatory mesozooplankton | hyperid amphipods | 0.0002 | 90 |
| 455 | 2C | shallowwater benthic fish | sculpins          | 0.0045 | 90 |
| 455 | 2C | Shrimp                    | shrimp            | 0.0263 | 90 |
| 467 | 1C | other fish                | unid fish         | 1.0000 | 1  |
| 467 | 2A | Herring                   | herring           | 0.5351 | 5  |
| 467 | 2A | Meiobenthos               | annelids          | 0.0001 | 5  |
| 467 | 2A | Meiobenthos               | nematodes         | 0.0010 | 5  |
| 467 | 2A | other fish                | bony fishes       | 0.4638 | 5  |
| 467 | 2C | other fish                | bony fishes       | 1.0000 | 2  |
| 467 | 2D | english sole              | english sole      | 0.4486 | 4  |
| 467 | 2D | Meiobenthos               | nematodes         | 0.0000 | 4  |
| 467 | 2D | other fish                | bony fishes       | 0.5514 | 4  |
| 467 | 3C | Meiobenthos               | nematodes         | 0.0002 | 11 |
| 467 | 3C | other fish                | bony fishes       | 0.6833 | 11 |
| 467 | 3C | other flatfish            | yellowfin sole    | 0.1378 | 11 |
| 467 | 3C | Salmon                    | salmon            | 0.0309 | 11 |
| 467 | 3C | shallowwater benthic fish | sculpins          | 0.1477 | 11 |
| 467 | 3D | Meiobenthos               | nematodes         | 0.0142 | 2  |
| 467 | 3D | other fish                | bony fishes       | 0.9858 | 2  |
| 596 | 2D | Epibenthos                | mysids            | 0.4482 | 27 |
| 596 | 2D | Euphausiids               | euphausiids       | 0.4349 | 27 |
| 596 | 2D | Macrobenthos              | anomurans         | 0.0003 | 27 |
| 596 | 2D | Macrobenthos              | crabs             | 0.0303 | 27 |
| 596 | 2D | other fish                | bony fishes       | 0.0393 | 27 |
| 596 | 2D | other flatfish            | dabs              | 0.0207 | 27 |
| 596 | 2D | predatory mesozooplankton | amphipods         | 0.0003 | 27 |
| 596 | 2D | predatory mesozooplankton | gammarids         | 0.0002 | 27 |
| 596 | 2D | Shrimp                    | shrimp            | 0.0051 | 27 |
| 596 | 2D | Turbot                    | turbot            | 0.0208 | 27 |
| 596 | 3A | Euphausiids               | euphausiids       | 0.5942 | 1  |
| 596 | 3A | Shrimp                    | shrimp            | 0.4058 | 1  |
| 596 | 3D | Copepods                  | copepods          | 0.0012 | 62 |
| 596 | 3D | Epibenthos                | isopods           | 0.0010 | 62 |
| 596 | 3D | Epibenthos                | mysids            | 0.0001 | 62 |
| 596 | 3D | Euphausiids               | euphausiids       | 0.1595 | 62 |
| 596 | 3D | jellies/macrozooplankton  | tunicates         | 0.0056 | 62 |
| 596 | 3D | Macrobenthos              | anomurans         | 0.1239 | 62 |
| 596 | 3D | Macrobenthos              | ascidians         | 0.0861 | 62 |

|     |     |                           |                            |        |     |
|-----|-----|---------------------------|----------------------------|--------|-----|
| 596 | 3 D | Macrobenthos              | chaetognaths               | 0.0056 | 62  |
| 596 | 3 D | Macrobenthos              | crustacea with mandibles   | 0.2275 | 62  |
| 596 | 3 D | Macrobenthos              | echinoderms                | 0.0034 | 62  |
| 596 | 3 D | Macrobenthos              | gastropods                 | 0.0006 | 62  |
| 596 | 3 D | Macrobenthos              | peanut worms               | 0.0000 | 62  |
| 596 | 3 D | Meiobenthos               | annelids                   | 0.0670 | 62  |
| 596 | 3 D | Meiobenthos               | nematodes                  | 0.0013 | 62  |
| 596 | 3 D | other fish                | bony fishes                | 0.0025 | 62  |
| 596 | 3 D | predatory mesozooplankton | amphipods                  | 0.0418 | 62  |
| 596 | 3 D | predatory mesozooplankton | cumaceans                  | 0.0000 | 62  |
| 596 | 3 D | predatory mesozooplankton | gammarids                  | 0.0190 | 62  |
| 596 | 3 D | Shrimp                    | shrimp                     | 0.2537 | 62  |
| 598 | 1 B | Epibenthos                | mysids                     | 0.0510 | 85  |
| 598 | 1 B | Euphausiids               | euphausiids                | 0.0138 | 85  |
| 598 | 1 B | Macrobenthos              | bivalves                   | 0.0008 | 85  |
| 598 | 1 B | Macrobenthos              | crabs                      | 0.0438 | 85  |
| 598 | 1 B | Macrobenthos              | crabs,shrimps and lobsters | 0.0948 | 85  |
| 598 | 1 B | Macrobenthos              | crustacea with mandibles   | 0.0462 | 85  |
| 598 | 1 B | Meiobenthos               | annelids                   | 0.0314 | 85  |
| 598 | 1 B | other fish                | bony fishes                | 0.0181 | 85  |
| 598 | 1 B | other fish                | unid fish                  | 0.0205 | 85  |
| 598 | 1 B | other flatfish            | flatfishes                 | 0.0088 | 85  |
| 598 | 1 B | predatory mesozooplankton | amphipods                  | 0.0026 | 85  |
| 598 | 1 B | predatory mesozooplankton | cumaceans                  | 0.0022 | 85  |
| 598 | 1 B | predatory mesozooplankton | gammarids                  | 0.0218 | 85  |
| 598 | 1 B | shallowwater benthic fish | clingfishes                | 0.0004 | 85  |
| 598 | 1 B | Shrimp                    | shrimp                     | 0.6437 | 85  |
| 598 | 2 B | Epibenthos                | mysids                     | 0.3876 | 2   |
| 598 | 2 B | Shrimp                    | shrimp                     | 0.6124 | 2   |
| 598 | 3 B | forage fish               | sandlance                  | 0.9882 | 1   |
| 598 | 3 B | Macrobenthos              | crabs                      | 0.0118 | 1   |
| 602 | 1 A | Euphausiids               | euphausiids                | 0.4790 | 264 |
| 602 | 1 A | forage fish               | sandlance                  | 0.0011 | 264 |
| 602 | 1 A | Herring                   | herring                    | 0.3572 | 264 |
| 602 | 1 A | Macrobenthos              | crabs                      | 0.0397 | 264 |
| 602 | 1 A | Meiobenthos               | annelids                   | 0.0096 | 264 |
| 602 | 1 A | other fish                | unid fish                  | 0.0955 | 264 |
| 602 | 1 A | predatory mesozooplankton | cumaceans                  | 0.0001 | 264 |

|     |     |                           |                            |        |     |
|-----|-----|---------------------------|----------------------------|--------|-----|
| 602 | 1 A | Shrimp                    | shrimp                     | 0.0178 | 264 |
| 602 | 1 C | Euphausiids               | euphausiids                | 0.0017 | 70  |
| 602 | 1 C | forage fish               | sandlance                  | 0.0393 | 70  |
| 602 | 1 C | Herring                   | herring                    | 0.2915 | 70  |
| 602 | 1 C | Macrobenthos              | crabs                      | 0.0432 | 70  |
| 602 | 1 C | Macrobenthos              | crabs,shrimps and lobsters | 0.0466 | 70  |
| 602 | 1 C | Macrobenthos              | crustacea with mandibles   | 0.0174 | 70  |
| 602 | 1 C | other fish                | bony fishes                | 0.4040 | 70  |
| 602 | 1 C | other fish                | unid fish                  | 0.0092 | 70  |
| 602 | 1 C | other flatfish            | flatfishes                 | 0.0075 | 70  |
| 602 | 1 C | Shrimp                    | shrimp                     | 0.1394 | 70  |
| 602 | 2 A | Euphausiids               | euphausiids                | 0.0004 | 101 |
| 602 | 2 A | forage fish               | sandlance                  | 0.2675 | 101 |
| 602 | 2 A | Herring                   | herring                    | 0.0799 | 101 |
| 602 | 2 A | Macrobenthos              | crabs                      | 0.0128 | 101 |
| 602 | 2 A | Macrobenthos              | crabs,shrimps and lobsters | 0.0049 | 101 |
| 602 | 2 A | Macrobenthos              | crustacea                  | 0.0000 | 101 |
| 602 | 2 A | Macrobenthos              | crustacea with mandibles   | 0.0011 | 101 |
| 602 | 2 A | Macrobenthos              | echinoderms                | 0.0003 | 101 |
| 602 | 2 A | Meiobenthos               | annelids                   | 0.0001 | 101 |
| 602 | 2 A | Meiobenthos               | nematodes                  | 0.0001 | 101 |
| 602 | 2 A | other fish                | bony fishes                | 0.4648 | 101 |
| 602 | 2 A | other fish                | unid fish                  | 0.1198 | 101 |
| 602 | 2 A | shallowwater benthic fish | gadids                     | 0.0270 | 101 |
| 602 | 2 A | shallowwater benthic fish | perch                      | 0.0032 | 101 |
| 602 | 2 A | Shrimp                    | shrimp                     | 0.0163 | 101 |
| 602 | 2 A | walleye pollock           | walleye pollock            | 0.0018 | 101 |
| 602 | 2 C | Epibenthos                | mysids                     | 0.0000 | 205 |
| 602 | 2 C | Euphausiids               | euphausiids                | 0.0470 | 205 |
| 602 | 2 C | Herring                   | herring                    | 0.1021 | 205 |
| 602 | 2 C | inshore rockfish          | rockfish                   | 0.0490 | 205 |
| 602 | 2 C | Macrobenthos              | cnidaria                   | 0.0000 | 205 |
| 602 | 2 C | Macrobenthos              | crabs                      | 0.0355 | 205 |
| 602 | 2 C | Macrobenthos              | crabs,shrimps and lobsters | 0.0802 | 205 |
| 602 | 2 C | Macrobenthos              | crustacea with mandibles   | 0.0338 | 205 |
| 602 | 2 C | Macrobenthos              | echinoderms                | 0.0000 | 205 |
| 602 | 2 C | Macrobenthos              | gastropods                 | 0.0000 | 205 |
| 602 | 2 C | Meiobenthos               | annelids                   | 0.0004 | 205 |
| 602 | 2 C | Meiobenthos               | nematodes                  | 0.0012 | 205 |
| 602 | 2 C | Meiobenthos               | proboscis worms            | 0.0000 | 205 |
| 602 | 2 C | other fish                | bony fishes                | 0.6037 | 205 |
| 602 | 2 C | other fish                | unid fish                  | 0.0019 | 205 |



|     |     |                           |                            |        |     |
|-----|-----|---------------------------|----------------------------|--------|-----|
| 602 | 2 C | other flatfish            | flathead sole              | 0.0077 | 205 |
| 602 | 2 C | shallowwater benthic fish | eelpout                    | 0.0055 | 205 |
| 602 | 2 C | Shrimp                    | shrimp                     | 0.0320 | 205 |
| 602 | 2 D | Epibenthos                | mysids                     | 0.1882 | 49  |
| 602 | 2 D | Euphausiids               | euphausiids                | 0.0297 | 49  |
| 602 | 2 D | Herring                   | herring                    | 0.1828 | 49  |
| 602 | 2 D | Macrobenthos              | crabs                      | 0.0073 | 49  |
| 602 | 2 D | Macrobenthos              | crabs,shrimps and lobsters | 0.0285 | 49  |
| 602 | 2 D | Macrobenthos              | crustacea with mandibles   | 0.0236 | 49  |
| 602 | 2 D | Meiobenthos               | nematodes                  | 0.0001 | 49  |
| 602 | 2 D | other fish                | bony fishes                | 0.2662 | 49  |
| 602 | 2 D | other fish                | unid fish                  | 0.1320 | 49  |
| 602 | 2 D | shallowwater benthic fish | gadids                     | 0.1415 | 49  |
| 602 | 3 A | Euphausiids               | euphausiids                | 0.0975 | 120 |
| 602 | 3 A | forage fish               | eulachon                   | 0.0179 | 120 |
| 602 | 3 A | Herring                   | herring                    | 0.1565 | 120 |
| 602 | 3 A | Macrobenthos              | cnidaria                   | 0.0002 | 120 |
| 602 | 3 A | Macrobenthos              | crabs                      | 0.0094 | 120 |
| 602 | 3 A | Macrobenthos              | crabs,shrimps and lobsters | 0.3660 | 120 |
| 602 | 3 A | Macrobenthos              | crustacea with mandibles   | 0.0278 | 120 |
| 602 | 3 A | Macrobenthos              | echinoderms                | 0.0015 | 120 |
| 602 | 3 A | other fish                | bony fishes                | 0.1764 | 120 |
| 602 | 3 A | predatory invertebrates   | cephalopods                | 0.0020 | 120 |
| 602 | 3 A | shallowwater benthic fish | sculpins                   | 0.0594 | 120 |
| 602 | 3 A | Shrimp                    | shrimp                     | 0.0853 | 120 |
| 602 | 3 C | Euphausiids               | euphausiids                | 0.0003 | 86  |
| 602 | 3 C | Macrobenthos              | bivalves                   | 0.0000 | 86  |
| 602 | 3 C | Macrobenthos              | crabs                      | 0.0050 | 86  |
| 602 | 3 C | Macrobenthos              | crabs,shrimps and lobsters | 0.0643 | 86  |
| 602 | 3 C | Macrobenthos              | crustacea with mandibles   | 0.0445 | 86  |
| 602 | 3 C | Macrobenthos              | gastropods                 | 0.0002 | 86  |
| 602 | 3 C | Meiobenthos               | annelids                   | 0.0005 | 86  |
| 602 | 3 C | other fish                | bony fishes                | 0.8715 | 86  |
| 602 | 3 C | predatory invertebrates   | cephalopods                | 0.0046 | 86  |
| 602 | 3 C | predatory mesozooplankton | decapods                   | 0.0002 | 86  |
| 602 | 3 C | Shrimp                    | shrimp                     | 0.0089 | 86  |
| 602 | 3 D | Epibenthos                | mysids                     | 0.0040 | 8   |
| 602 | 3 D | Euphausiids               | euphausiids                | 0.0712 | 8   |
| 602 | 3 D | Macrobenthos              | crabs,shrimps and lobsters | 0.4759 | 8   |
| 602 | 3 D | Macrobenthos              | crustacea with             | 0.0647 | 8   |

|     |     |                           |                 |        |     |
|-----|-----|---------------------------|-----------------|--------|-----|
|     |     |                           | mandibles       |        |     |
| 602 | 3 D | other fish                | bony fishes     | 0.3832 | 8   |
|     |     | predatory                 |                 |        |     |
| 602 | 3 D | mesozooplankton           | amphipods       | 0.0011 | 8   |
| 607 | 1 A | Epibenthos                | isopods         | 0.0053 | 2   |
| 607 | 1 A | Macrobenthos              | anomurans       | 0.0827 | 2   |
| 607 | 1 A | Macrobenthos              | bivalves        | 0.0267 | 2   |
| 607 | 1 A | Macrobenthos              | crabs           | 0.2373 | 2   |
| 607 | 1 A | Shrimp                    | shrimp          | 0.6480 | 2   |
| 607 | 2 D | Epibenthos                | mysids          | 0.5861 | 55  |
| 607 | 2 D | Euphausiids               | euphausiids     | 0.1028 | 55  |
| 607 | 2 D | Macrobenthos              | anomurans       | 0.0000 | 55  |
| 607 | 2 D | Macrobenthos              | bivalves        | 0.0062 | 55  |
| 607 | 2 D | Macrobenthos              | crabs           | 0.0225 | 55  |
|     |     |                           | crustacea with  |        |     |
| 607 | 2 D | Macrobenthos              | mandibles       | 0.0005 | 55  |
| 607 | 2 D | Macrobenthos              | echinoderms     | 0.0000 | 55  |
| 607 | 2 D | Meiobenthos               | annelids        | 0.0000 | 55  |
| 607 | 2 D | Meiobenthos               | nematodes       | 0.0000 | 55  |
| 607 | 2 D | other fish                | bony fishes     | 0.2294 | 55  |
| 607 | 2 D | other flatfish            | dabs            | 0.0006 | 55  |
|     |     | predatory                 |                 |        |     |
| 607 | 2 D | mesozooplankton           | cumaceans       | 0.0000 | 55  |
| 607 | 2 D | shallowwater benthic fish | agonidae        | 0.0003 | 55  |
| 607 | 2 D | Shrimp                    | shrimp          | 0.0170 | 55  |
| 607 | 2 D | Squid                     | squid           | 0.0037 | 55  |
| 607 | 2 D | walleye pollock           | walleye pollock | 0.0308 | 55  |
| 607 | 3 C | Euphausiids               | euphausiids     | 0.0023 | 45  |
| 607 | 3 C | Herring                   | herring         | 0.7310 | 45  |
| 607 | 3 C | Macrobenthos              | crabs           | 0.0042 | 45  |
|     |     |                           | crustacea with  |        |     |
| 607 | 3 C | Macrobenthos              | mandibles       | 0.0068 | 45  |
| 607 | 3 C | Meiobenthos               | annelids        | 0.0001 | 45  |
| 607 | 3 C | Meiobenthos               | nematodes       | 0.0001 | 45  |
| 607 | 3 C | other fish                | bony fishes     | 0.2031 | 45  |
| 607 | 3 C | predatory invertebrates   | cephalopods     | 0.0054 | 45  |
| 607 | 3 C | Salmon                    | salmon          | 0.0090 | 45  |
| 607 | 3 C | shallowwater benthic fish | agonidae        | 0.0115 | 45  |
| 607 | 3 C | shallowwater benthic fish | sculpins        | 0.0090 | 45  |
| 607 | 3 C | Shrimp                    | shrimp          | 0.0129 | 45  |
| 607 | 3 C | Squid                     | squid           | 0.0047 | 45  |
|     |     |                           | crustacea with  |        |     |
| 607 | 3 D | Macrobenthos              | mandibles       | 1.0000 | 2   |
| 610 | 1 A | Epibenthos                | isopods         | 0.0017 | 130 |
| 610 | 1 A | Euphausiids               | euphausiids     | 0.0005 | 130 |
| 610 | 1 A | Macrobenthos              | anomurans       | 0.0000 | 130 |
| 610 | 1 A | Macrobenthos              | bivalves        | 0.0051 | 130 |
| 610 | 1 A | Macrobenthos              | crabs           | 0.1723 | 130 |



|     |     |                           |                          |        |     |
|-----|-----|---------------------------|--------------------------|--------|-----|
| 610 | 1 A | Macrobenthos              | crustacea with mandibles | 0.0043 | 130 |
| 610 | 1 A | Macrobenthos              | echinoderms              | 0.0002 | 130 |
| 610 | 1 A | Macrobenthos              | echiurans                | 0.5135 | 130 |
| 610 | 1 A | Macrobenthos              | reptantia                | 0.0005 | 130 |
| 610 | 1 A | Meiobenthos               | annelids                 | 0.2693 | 130 |
| 610 | 1 A | predatory mesozooplankton | cumaceans                | 0.0041 | 130 |
| 610 | 1 A | predatory mesozooplankton | gammarids                | 0.0085 | 130 |
| 610 | 1 A | Shrimp                    | shrimp                   | 0.0200 | 130 |
| 610 | 1 C | Epibenthos                | isopods                  | 0.0139 | 98  |
| 610 | 1 C | Epibenthos                | tanaidaceans             | 0.0000 | 98  |
| 610 | 1 C | Euphausiids               | euphausiids              | 0.0005 | 98  |
| 610 | 1 C | Macrobenthos              | bivalves                 | 0.0023 | 98  |
| 610 | 1 C | Macrobenthos              | crabs                    | 0.0161 | 98  |
| 610 | 1 C | Macrobenthos              | crustacea with mandibles | 0.0053 | 98  |
| 610 | 1 C | Macrobenthos              | echinoderms              | 0.0040 | 98  |
| 610 | 1 C | Macrobenthos              | echiurans                | 0.0056 | 98  |
| 610 | 1 C | Macrobenthos              | gastropods               | 0.0001 | 98  |
| 610 | 1 C | Meiobenthos               | annelids                 | 0.9236 | 98  |
| 610 | 1 C | Microzooplankton          | protozoa                 | 0.0000 | 98  |
| 610 | 1 C | predatory mesozooplankton | caprellid amphipods      | 0.0000 | 98  |
| 610 | 1 C | predatory mesozooplankton | cumaceans                | 0.0012 | 98  |
| 610 | 1 C | predatory mesozooplankton | gammarids                | 0.0249 | 98  |
| 610 | 1 C | predatory mesozooplankton | ostracods                | 0.0001 | 98  |
| 610 | 1 C | Shrimp                    | shrimp                   | 0.0023 | 98  |
| 610 | 2 A | Epibenthos                | isopods                  | 0.0003 | 34  |
| 610 | 2 A | Epibenthos                | mysids                   | 0.0005 | 34  |
| 610 | 2 A | Macrobenthos              | crabs                    | 0.0453 | 34  |
| 610 | 2 A | Macrobenthos              | echiurans                | 0.0178 | 34  |
| 610 | 2 A | Meiobenthos               | annelids                 | 0.1258 | 34  |
| 610 | 2 A | other fish                | unid fish                | 0.0006 | 34  |
| 610 | 2 A | predatory mesozooplankton | cumaceans                | 0.0001 | 34  |
| 610 | 2 A | predatory mesozooplankton | gammarids                | 0.0095 | 34  |
| 610 | 2 A | Shrimp                    | shrimp                   | 0.8002 | 34  |
| 610 | 2 C | Epibenthos                | mysids                   | 0.0010 | 148 |
| 610 | 2 C | Euphausiids               | euphausiids              | 0.0018 | 148 |
| 610 | 2 C | Macrobenthos              | anomurans                | 0.0051 | 148 |
| 610 | 2 C | Macrobenthos              | bivalves                 | 0.0114 | 148 |
| 610 | 2 C | Macrobenthos              | crabs                    | 0.0110 | 148 |

|     |    |                           |                          |        |     |
|-----|----|---------------------------|--------------------------|--------|-----|
| 610 | 2C | Macrobenthos              | crustacea with mandibles | 0.0009 | 148 |
| 610 | 2C | Macrobenthos              | echinoderms              | 0.0074 | 148 |
| 610 | 2C | Macrobenthos              | echiurans                | 0.0077 | 148 |
| 610 | 2C | Meiobenthos               | annelids                 | 0.7541 | 148 |
| 610 | 2C | other fish                | unid fish                | 0.0015 | 148 |
| 610 | 2C | predatory mesozooplankton | caprellid amphipods      | 0.0001 | 148 |
| 610 | 2C | predatory mesozooplankton | cumaceans                | 0.0012 | 148 |
| 610 | 2C | predatory mesozooplankton | gammarids                | 0.0735 | 148 |
| 610 | 2C | predatory mesozooplankton | ostracods                | 0.0001 | 148 |
| 610 | 2C | shallowwater benthic fish | sculpins                 | 0.0020 | 148 |
| 610 | 2C | Shrimp                    | shrimp                   | 0.1213 | 148 |
| 610 | 2D | Copepods                  | copepods                 | 0.0000 | 46  |
| 610 | 2D | Epibenthos                | mysids                   | 0.0035 | 46  |
| 610 | 2D | Macrobenthos              | anomurans                | 0.0203 | 46  |
| 610 | 2D | Macrobenthos              | bivalves                 | 0.0154 | 46  |
| 610 | 2D | Macrobenthos              | crabs                    | 0.5981 | 46  |
| 610 | 2D | Macrobenthos              | echiurans                | 0.0297 | 46  |
| 610 | 2D | Macrobenthos              | gastropods               | 0.0000 | 46  |
| 610 | 2D | Meiobenthos               | annelids                 | 0.2349 | 46  |
| 610 | 2D | Meiobenthos               | proboscis worms          | 0.0091 | 46  |
| 610 | 2D | other fish                | unid fish                | 0.0017 | 46  |
| 610 | 2D | predatory mesozooplankton | caprellid amphipods      | 0.0001 | 46  |
| 610 | 2D | predatory mesozooplankton | cumaceans                | 0.0001 | 46  |
| 610 | 2D | predatory mesozooplankton | gammarids                | 0.0212 | 46  |
| 610 | 2D | Shrimp                    | shrimp                   | 0.0659 | 46  |
| 610 | 3A | Euphausiids               | euphausiids              | 0.1472 | 23  |
| 610 | 3A | jellies/macrozooplankton  | medusae                  | 0.0002 | 23  |
| 610 | 3A | Macrobenthos              | bivalves                 | 0.4673 | 23  |
| 610 | 3A | Macrobenthos              | crabs                    | 0.0009 | 23  |
| 610 | 3A | Macrobenthos              | crustacea with mandibles | 0.0504 | 23  |
| 610 | 3A | Meiobenthos               | annelids                 | 0.2973 | 23  |
| 610 | 3A | predatory mesozooplankton | gammarids                | 0.0010 | 23  |
| 610 | 3A | Shrimp                    | shrimp                   | 0.0358 | 23  |
| 610 | 3C | Euphausiids               | euphausiids              | 0.0039 | 69  |
| 610 | 3C | Macrobenthos              | ascidians                | 0.0004 | 69  |
| 610 | 3C | Macrobenthos              | bivalves                 | 0.0016 | 69  |
| 610 | 3C | Macrobenthos              | crabs                    | 0.0622 | 69  |
| 610 | 3C | Macrobenthos              | crustacea with           | 0.0277 | 69  |

|     |     |                 |                |        |    |
|-----|-----|-----------------|----------------|--------|----|
|     |     |                 | mandibles      |        |    |
| 610 | 3 C | Macrobenthos    | echinoderms    | 0.0525 | 69 |
| 610 | 3 C | Macrobenthos    | gastropods     | 0.0006 | 69 |
| 610 | 3 C | Macrobenthos    | sponges        | 0.0004 | 69 |
| 610 | 3 C | Meiobenthos     | annelids       | 0.7410 | 69 |
| 610 | 3 C | Meiobenthos     | nematodes      | 0.0075 | 69 |
|     |     | predatory       |                |        |    |
| 610 | 3 C | mesozooplankton | amphipods      | 0.0164 | 69 |
|     |     | predatory       |                |        |    |
| 610 | 3 C | mesozooplankton | decapods       | 0.0005 | 69 |
|     |     | predatory       |                |        |    |
| 610 | 3 C | mesozooplankton | gammarids      | 0.0499 | 69 |
| 610 | 3 C | Shrimp          | shrimp         | 0.0356 | 69 |
| 610 | 3 D | Euphausiids     | euphausiids    | 0.0008 | 15 |
| 610 | 3 D | Macrobenthos    | bivalves       | 0.0042 | 15 |
| 610 | 3 D | Macrobenthos    | crabs          | 0.0105 | 15 |
|     |     |                 | crustacea with |        |    |
| 610 | 3 D | Macrobenthos    | mandibles      | 0.7534 | 15 |
| 610 | 3 D | Macrobenthos    | gastropods     | 0.0561 | 15 |
| 610 | 3 D | Meiobenthos     | annelids       | 0.0829 | 15 |
| 610 | 3 D | Meiobenthos     | nematodes      | 0.0088 | 15 |
|     |     | predatory       |                |        |    |
| 610 | 3 D | mesozooplankton | amphipods      | 0.0239 | 15 |
|     |     | predatory       |                |        |    |
| 610 | 3 D | mesozooplankton | gammarids      | 0.0595 | 15 |
| 612 | 1 C | Epibenthos      | isopods        | 0.0014 | 19 |
| 612 | 1 C | Macrobenthos    | bivalves       | 0.0016 | 19 |
| 612 | 1 C | Macrobenthos    | echinoderms    | 0.9700 | 19 |
| 612 | 1 C | Meiobenthos     | annelids       | 0.0270 | 19 |
| 612 | 2 C | Epibenthos      | mysids         | 0.0472 | 69 |
| 612 | 2 C | Euphausiids     | euphausiids    | 0.0014 | 69 |
| 612 | 2 C | Macrobenthos    | crabs          | 0.0155 | 69 |
|     |     |                 | crustacea with |        |    |
| 612 | 2 C | Macrobenthos    | mandibles      | 0.0003 | 69 |
| 612 | 2 C | Macrobenthos    | echinoderms    | 0.0322 | 69 |
| 612 | 2 C | Meiobenthos     | annelids       | 0.0064 | 69 |
| 612 | 2 C | other fish      | unid fish      | 0.0145 | 69 |
|     |     | predatory       |                |        |    |
| 612 | 2 C | mesozooplankton | gammarids      | 0.0010 | 69 |
| 612 | 2 C | Shrimp          | shrimp         | 0.8814 | 69 |
| 612 | 3 C | Euphausiids     | euphausiids    | 0.0567 | 8  |
| 612 | 3 C | Macrobenthos    | crabs          | 0.1511 | 8  |
|     |     |                 | crustacea with |        |    |
| 612 | 3 C | Macrobenthos    | mandibles      | 0.1764 | 8  |
| 612 | 3 C | Macrobenthos    | echinoderms    | 0.3246 | 8  |
| 612 | 3 C | Macrobenthos    | gastropods     | 0.1391 | 8  |
| 612 | 3 C | Shrimp          | shrimp         | 0.1521 | 8  |
| 614 | 1 A | Macrobenthos    | anomurans      | 0.5882 | 2  |

|     |     |                           |                          |        |    |
|-----|-----|---------------------------|--------------------------|--------|----|
| 614 | 1 A | Macrobenthos              | crabs                    | 0.3358 | 2  |
| 614 | 1 A | Macrobenthos              | reptantia                | 0.0760 | 2  |
| 614 | 1 B | dungeness crab            | dungeness crab           | 0.0036 | 30 |
| 614 | 1 B | forage fish               | sandlance                | 0.0265 | 30 |
| 614 | 1 B | jellies/macrozooplankton  | medusae                  | 0.0027 | 30 |
| 614 | 1 B | Macrobenthos              | anomurans                | 0.0655 | 30 |
| 614 | 1 B | Macrobenthos              | bivalves                 | 0.4658 | 30 |
| 614 | 1 B | Macrobenthos              | crabs                    | 0.2980 | 30 |
| 614 | 1 B | Macrobenthos              | gastropods               | 0.0021 | 30 |
| 614 | 1 B | Macrobenthos              | reptantia                | 0.0260 | 30 |
| 614 | 1 B | other fish                | unid fish                | 0.0219 | 30 |
| 614 | 1 B | other flatfish            | flatfishes               | 0.0689 | 30 |
| 614 | 1 B | shallowwater benthic fish | sculpins                 | 0.0190 | 30 |
| 614 | 1 C | Macrobenthos              | anomurans                | 0.1045 | 4  |
| 614 | 1 C | Macrobenthos              | bivalves                 | 0.0741 | 4  |
| 614 | 1 C | Macrobenthos              | crabs                    | 0.7122 | 4  |
| 614 | 1 C | Macrobenthos              | reptantia                | 0.0545 | 4  |
| 614 | 1 C | other fish                | unid fish                | 0.0547 | 4  |
| 614 | 2 A | Dover sole                | Dover sole               | 0.0027 | 88 |
| 614 | 2 A | forage fish               | sandlance                | 0.2241 | 88 |
| 614 | 2 A | Herring                   | herring                  | 0.1085 | 88 |
| 614 | 2 A | jellies/macrozooplankton  | medusae                  | 0.0002 | 88 |
| 614 | 2 A | Macrobenthos              | anomurans                | 0.0039 | 88 |
| 614 | 2 A | Macrobenthos              | bivalves                 | 0.0357 | 88 |
| 614 | 2 A | Macrobenthos              | cnidaria                 | 0.0003 | 88 |
| 614 | 2 A | Macrobenthos              | crabs                    | 0.0529 | 88 |
| 614 | 2 A | Macrobenthos              | crustacea with mandibles | 0.0006 | 88 |
| 614 | 2 A | Macrobenthos              | echinoderms              | 0.0002 | 88 |
| 614 | 2 A | Macrobenthos              | echiurans                | 0.0002 | 88 |
| 614 | 2 A | Macrobenthos              | gastropods               | 0.0010 | 88 |
| 614 | 2 A | Meiobenthos               | annelids                 | 0.0095 | 88 |
| 614 | 2 A | Meiobenthos               | nematodes                | 0.0000 | 88 |
| 614 | 2 A | Meiobenthos               | proboscis worms          | 0.0004 | 88 |
| 614 | 2 A | other fish                | bony fishes              | 0.1257 | 88 |
| 614 | 2 A | other fish                | unid fish                | 0.0207 | 88 |
| 614 | 2 A | other flatfish            | dabs                     | 0.0227 | 88 |
| 614 | 2 A | other flatfish            | sand sole                | 0.0448 | 88 |
| 614 | 2 A | pacific cod               | pacific cod              | 0.0113 | 88 |
| 614 | 2 A | predatory invertebrates   | octopus                  | 0.0581 | 88 |
| 614 | 2 A | predatory mesozooplankton | amphipods                | 0.0000 | 88 |
| 614 | 2 A | shallowwater benthic fish | gadids                   | 0.0321 | 88 |
| 614 | 2 A | Shrimp                    | shrimp                   | 0.0004 | 88 |
| 614 | 2 A | Turbot                    | turbot                   | 0.2439 | 88 |
| 614 | 2 B | forage fish               | sandlance                | 0.0228 | 9  |
| 614 | 2 B | jellies/macrozooplankton  | medusae                  | 0.0006 | 9  |
| 614 | 2 B | Macrobenthos              | anomurans                | 0.0689 | 9  |

|     |    |                              |                               |        |     |
|-----|----|------------------------------|-------------------------------|--------|-----|
| 614 | 2B | Macrobenthos                 | bivalves                      | 0.2155 | 9   |
| 614 | 2B | Macrobenthos                 | crabs                         | 0.4259 | 9   |
| 614 | 2B | Macrobenthos                 | echinoderms                   | 0.0002 | 9   |
| 614 | 2B | other fish                   | bony fishes                   | 0.0767 | 9   |
| 614 | 2B | other flatfish               | dabs                          | 0.0100 | 9   |
| 614 | 2B | other flatfish               | flatfishes                    | 0.0128 | 9   |
| 614 | 2B | other flatfish               | sand sole                     | 0.1187 | 9   |
| 614 | 2B | predatory invertebrates      | cephalopods                   | 0.0197 | 9   |
| 614 | 2B | shallowwater benthic fish    | pacific tomcod                | 0.0196 | 9   |
| 614 | 2B | Shrimp                       | shrimp                        | 0.0001 | 9   |
| 614 | 2B | walleye pollock              | walleye pollock               | 0.0084 | 9   |
| 614 | 2D | Epibenthos                   | mysids                        | 0.0270 | 5   |
| 614 | 2D | Euphausiids                  | euphausiids                   | 0.0013 | 5   |
| 614 | 2D | other flatfish               | flatfishes                    | 0.3890 | 5   |
| 614 | 2D | Salmon                       | salmon                        | 0.5827 | 5   |
| 614 | 3A | Macrobenthos                 | bivalves                      | 0.9771 | 2   |
| 614 | 3A | Meiobenthos                  | annelids                      | 0.0229 | 2   |
| 614 | 3B | Macrobenthos                 | anomurans                     | 0.0206 | 2   |
| 614 | 3B | Macrobenthos                 | crabs                         | 0.9519 | 2   |
| 614 | 3B | Macrobenthos                 | crustacea with<br>mandibles   | 0.0276 | 2   |
| 614 | 3C | Herring                      | herring                       | 0.4495 | 7   |
| 614 | 3C | Meiobenthos                  | annelids                      | 0.0027 | 7   |
| 614 | 3C | Meiobenthos                  | nematodes                     | 0.0014 | 7   |
| 614 | 3C | other fish                   | bony fishes                   | 0.3723 | 7   |
| 614 | 3C | shallowwater benthic fish    | gadids                        | 0.0022 | 7   |
| 614 | 3C | shallowwater benthic fish    | pacific tomcod                | 0.1718 | 7   |
| 614 | 3D | pacific cod                  | pacific cod                   | 0.2608 | 3   |
| 614 | 3D | predatory invertebrates      | octopus                       | 0.1767 | 3   |
| 614 | 3D | shallowwater benthic fish    | gadids                        | 0.2588 | 3   |
| 614 | 3D | shallowwater benthic fish    | pacific tomcod                | 0.1672 | 3   |
| 614 | 3D | Squid                        | squid                         | 0.1365 | 3   |
| 619 | 2B | Epibenthos                   | barnacles                     | 0.0428 | 4   |
| 619 | 2B | forage fish                  | sandlance                     | 0.8471 | 4   |
| 619 | 2B | Meiobenthos                  | annelids                      | 0.1101 | 4   |
| 619 | 3D | Macrobenthos                 | bivalves                      | 0.6389 | 1   |
| 619 | 3D | predatory<br>mesozooplankton | amphipods                     | 0.2222 | 1   |
| 619 | 3D | predatory<br>mesozooplankton | gammarids                     | 0.1389 | 1   |
| 621 | 1B | Epibenthos                   | isopods                       | 0.0002 | 178 |
| 621 | 1B | forage fish                  | sandlance                     | 0.1236 | 178 |
| 621 | 1B | Macrobenthos                 | anomurans                     | 0.1349 | 178 |
| 621 | 1B | Macrobenthos                 | bivalves                      | 0.1667 | 178 |
| 621 | 1B | Macrobenthos                 | cnidaria                      | 0.0010 | 178 |
| 621 | 1B | Macrobenthos                 | crabs                         | 0.0531 | 178 |
| 621 | 1B | Macrobenthos                 | crabs,shrimps and<br>lobsters | 0.0022 | 178 |

|     |     |                           |                          |        |     |
|-----|-----|---------------------------|--------------------------|--------|-----|
| 621 | 1 B | Macrobenthos              | crustacea with mandibles | 0.0004 | 178 |
| 621 | 1 B | Macrobenthos              | echinoderms              | 0.0010 | 178 |
| 621 | 1 B | Macrobenthos              | gastropods               | 0.0055 | 178 |
| 621 | 1 B | Macrobenthos              | reptantia                | 0.0008 | 178 |
| 621 | 1 B | Meiobenthos               | annelids                 | 0.4086 | 178 |
| 621 | 1 B | Meiobenthos               | bryozoans                | 0.0041 | 178 |
| 621 | 1 B | Meiobenthos               | proboscis worms          | 0.0028 | 178 |
| 621 | 1 B | other fish                | bony fishes              | 0.0433 | 178 |
| 621 | 1 B | other fish                | unid fish                | 0.0152 | 178 |
| 621 | 1 B | predatory mesozooplankton | amphipods                | 0.0014 | 178 |
| 621 | 1 B | predatory mesozooplankton | cumaceans                | 0.0000 | 178 |
| 621 | 1 B | predatory mesozooplankton | decapods                 | 0.0121 | 178 |
| 621 | 1 B | predatory mesozooplankton | gammarids                | 0.0038 | 178 |
| 621 | 1 B | predatory mesozooplankton | hyperid amphipods        | 0.0000 | 178 |
| 621 | 1 B | shallowwater benthic fish | perch                    | 0.0053 | 178 |
| 621 | 1 B | shallowwater benthic fish | sculpins                 | 0.0001 | 178 |
| 621 | 1 B | Shrimp                    | shrimp                   | 0.0139 | 178 |
| 621 | 2 A | Macrobenthos              | crustacea with mandibles | 1.0000 | 1   |
| 621 | 2 B | Epibenthos                | barnacles                | 0.0010 | 121 |
| 621 | 2 B | Epibenthos                | isopods                  | 0.0000 | 121 |
| 621 | 2 B | forage fish               | sandlance                | 0.9359 | 121 |
| 621 | 2 B | Macrobenthos              | anomurans                | 0.0042 | 121 |
| 621 | 2 B | Macrobenthos              | bivalves                 | 0.0149 | 121 |
| 621 | 2 B | Macrobenthos              | crabs                    | 0.0051 | 121 |
| 621 | 2 B | Macrobenthos              | crustacea with mandibles | 0.0007 | 121 |
| 621 | 2 B | Meiobenthos               | annelids                 | 0.0215 | 121 |
| 621 | 2 B | other fish                | bony fishes              | 0.0006 | 121 |
| 621 | 2 B | other fish                | unid fish                | 0.0043 | 121 |
| 621 | 2 B | predatory mesozooplankton | amphipods                | 0.0001 | 121 |
| 621 | 2 B | predatory mesozooplankton | cumaceans                | 0.0000 | 121 |
| 621 | 2 B | predatory mesozooplankton | gammarids                | 0.0003 | 121 |
| 621 | 2 B | Shrimp                    | shrimp                   | 0.0114 | 121 |
| 621 | 2 D | Epibenthos                | barnacles                | 0.0030 | 31  |
| 621 | 2 D | Epibenthos                | mysids                   | 0.0139 | 31  |
| 621 | 2 D | Euphausiids               | euphausiids              | 0.0061 | 31  |
| 621 | 2 D | Macrobenthos              | anomurans                | 0.0094 | 31  |
| 621 | 2 D | Macrobenthos              | bivalves                 | 0.1594 | 31  |



|     |    |                           |                 |        |    |
|-----|----|---------------------------|-----------------|--------|----|
| 621 | 2D | Macrobenthos              | crabs           | 0.0191 | 31 |
|     |    |                           | crustacea with  |        |    |
| 621 | 2D | Macrobenthos              | mandibles       | 0.0068 | 31 |
| 621 | 2D | Macrobenthos              | echinoderms     | 0.1793 | 31 |
| 621 | 2D | Macrobenthos              | echiurans       | 0.1776 | 31 |
| 621 | 2D | Macrobenthos              | gastropods      | 0.0080 | 31 |
| 621 | 2D | Meiobenthos               | annelids        | 0.1522 | 31 |
| 621 | 2D | Meiobenthos               | proboscis worms | 0.0385 | 31 |
| 621 | 2D | other fish                | unid fish       | 0.0943 | 31 |
|     |    | predatory                 |                 |        |    |
| 621 | 2D | mesozooplankton           | gammarids       | 0.0108 | 31 |
| 621 | 2D | shallowwater benthic fish | agonidae        | 0.0008 | 31 |
| 621 | 2D | Shrimp                    | shrimp          | 0.0091 | 31 |
| 621 | 2D | Turbot                    | turbot          | 0.1117 | 31 |
| 621 | 3A | other fish                | bony fishes     | 1.0000 | 1  |
| 621 | 3B | english sole              | english sole    | 0.1912 | 9  |
| 621 | 3B | Euphausiids               | euphausiids     | 0.0005 | 9  |
| 621 | 3B | forage fish               | sandlance       | 0.4835 | 9  |
| 621 | 3B | Macrobenthos              | bivalves        | 0.0023 | 9  |
| 621 | 3B | Macrobenthos              | crabs           | 0.0225 | 9  |
|     |    |                           | crustacea with  |        |    |
| 621 | 3B | Macrobenthos              | mandibles       | 0.1206 | 9  |
| 621 | 3B | Macrobenthos              | peanut worms    | 0.0002 | 9  |
| 621 | 3B | Meiobenthos               | proboscis worms | 0.0042 | 9  |
| 621 | 3B | other fish                | bony fishes     | 0.1615 | 9  |
|     |    | predatory                 |                 |        |    |
| 621 | 3B | mesozooplankton           | amphipods       | 0.0025 | 9  |
|     |    | predatory                 |                 |        |    |
| 621 | 3B | mesozooplankton           | decapods        | 0.0051 | 9  |
| 621 | 3B | Shrimp                    | shrimp          | 0.0061 | 9  |
| 621 | 3D | Epibenthos                | isopods         | 0.0503 | 6  |
| 621 | 3D | Macrobenthos              | bivalves        | 0.0478 | 6  |
| 621 | 3D | Macrobenthos              | crabs           | 0.0336 | 6  |
|     |    |                           | crustacea with  |        |    |
| 621 | 3D | Macrobenthos              | mandibles       | 0.0005 | 6  |
| 621 | 3D | Meiobenthos               | annelids        | 0.0027 | 6  |
| 621 | 3D | Meiobenthos               | proboscis worms | 0.8384 | 6  |
|     |    | predatory                 |                 |        |    |
| 621 | 3D | mesozooplankton           | amphipods       | 0.0001 | 6  |
|     |    | predatory                 |                 |        |    |
| 621 | 3D | mesozooplankton           | gammarids       | 0.0006 | 6  |
| 621 | 3D | Shrimp                    | shrimp          | 0.0259 | 6  |
| 626 | 1A | Epibenthos                | isopods         | 0.0038 | 86 |
| 626 | 1A | Euphausiids               | euphausiids     | 0.0011 | 86 |
| 626 | 1A | Macrobenthos              | bivalves        | 0.0388 | 86 |
| 626 | 1A | Macrobenthos              | cnidaria        | 0.2241 | 86 |
| 626 | 1A | Macrobenthos              | crabs           | 0.0886 | 86 |
| 626 | 1A | Macrobenthos              | echinoderms     | 0.0864 | 86 |



|     |     |                           |                             |        |     |
|-----|-----|---------------------------|-----------------------------|--------|-----|
| 626 | 1 A | Macrobenthos              | echiurans                   | 0.0407 | 86  |
| 626 | 1 A | Macrobenthos              | gastropods                  | 0.0035 | 86  |
| 626 | 1 A | Meiobenthos               | annelids                    | 0.5031 | 86  |
| 626 | 1 A | predatory mesozooplankton | cumaceans                   | 0.0037 | 86  |
| 626 | 1 A | predatory mesozooplankton | gammarids                   | 0.0044 | 86  |
| 626 | 1 A | predatory mesozooplankton | ostracods                   | 0.0000 | 86  |
| 626 | 1 A | Shrimp                    | shrimp                      | 0.0016 | 86  |
| 626 | 1 C | Macrobenthos              | bivalves                    | 0.0007 | 27  |
| 626 | 1 C | Macrobenthos              | cnidaria                    | 0.0029 | 27  |
| 626 | 1 C | Macrobenthos              | crabs, shrimps and lobsters | 0.0238 | 27  |
| 626 | 1 C | Macrobenthos              | crustacea with mandibles    | 0.0084 | 27  |
| 626 | 1 C | Macrobenthos              | echinoderms                 | 0.1684 | 27  |
| 626 | 1 C | Macrobenthos              | peanut worms                | 0.0008 | 27  |
| 626 | 1 C | Macrobenthos              | prosobranchs                | 0.0254 | 27  |
| 626 | 1 C | Meiobenthos               | annelids                    | 0.7449 | 27  |
| 626 | 1 C | predatory mesozooplankton | amphipods                   | 0.0052 | 27  |
| 626 | 1 C | predatory mesozooplankton | gammarids                   | 0.0191 | 27  |
| 626 | 1 C | predatory mesozooplankton | hyperid amphipods           | 0.0004 | 27  |
| 626 | 2 A | Macrobenthos              | bivalves                    | 0.4645 | 3   |
| 626 | 2 A | Macrobenthos              | echinoderms                 | 0.0594 | 3   |
| 626 | 2 A | Meiobenthos               | annelids                    | 0.4391 | 3   |
| 626 | 2 A | Meiobenthos               | proboscis worms             | 0.0343 | 3   |
| 626 | 2 A | predatory mesozooplankton | amphipods                   | 0.0013 | 3   |
| 626 | 2 A | predatory mesozooplankton | gammarids                   | 0.0013 | 3   |
| 626 | 2 C | Copepods                  | copepods                    | 0.0001 | 170 |
| 626 | 2 C | Epibenthos                | isopods                     | 0.0003 | 170 |
| 626 | 2 C | Epibenthos                | mysids                      | 0.0002 | 170 |
| 626 | 2 C | Euphausiids               | euphausiids                 | 0.0009 | 170 |
| 626 | 2 C | jellies/macrozooplankton  | medusae                     | 0.0001 | 170 |
| 626 | 2 C | Macrobenthos              | anomurans                   | 0.0001 | 170 |
| 626 | 2 C | Macrobenthos              | ascidians                   | 0.0007 | 170 |
| 626 | 2 C | Macrobenthos              | bivalves                    | 0.0400 | 170 |
| 626 | 2 C | Macrobenthos              | cnidaria                    | 0.0155 | 170 |
| 626 | 2 C | Macrobenthos              | crabs                       | 0.0112 | 170 |
| 626 | 2 C | Macrobenthos              | crustacea with mandibles    | 0.0014 | 170 |
| 626 | 2 C | Macrobenthos              | echinoderms                 | 0.3027 | 170 |
| 626 | 2 C | Macrobenthos              | echiurans                   | 0.0026 | 170 |

|     |     |                           |                     |        |     |
|-----|-----|---------------------------|---------------------|--------|-----|
| 626 | 2 C | Macrobenthos              | gastropods          | 0.0030 | 170 |
| 626 | 2 C | Macrobenthos              | peanut worms        | 0.0003 | 170 |
| 626 | 2 C | Meiobenthos               | annelids            | 0.5712 | 170 |
| 626 | 2 C | Meiobenthos               | bryozoans           | 0.0001 | 170 |
| 626 | 2 C | Meiobenthos               | nematodes           | 0.0000 | 170 |
| 626 | 2 C | Meiobenthos               | proboscis worms     | 0.0022 | 170 |
| 626 | 2 C | Microzooplankton          | protozoa            | 0.0003 | 170 |
| 626 | 2 C | other fish                | bony fishes         | 0.0001 | 170 |
| 626 | 2 C | predatory mesozooplankton | amphipods           | 0.0141 | 170 |
| 626 | 2 C | predatory mesozooplankton | caprellid amphipods | 0.0003 | 170 |
| 626 | 2 C | predatory mesozooplankton | cumaceans           | 0.0017 | 170 |
| 626 | 2 C | predatory mesozooplankton | decapods            | 0.0080 | 170 |
| 626 | 2 C | predatory mesozooplankton | gammarids           | 0.0125 | 170 |
| 626 | 2 C | predatory mesozooplankton | ostracods           | 0.0000 | 170 |
| 626 | 2 C | Shrimp                    | shrimp              | 0.0104 | 170 |
| 626 | 2 D | Macrobenthos              | anomurans           | 0.2850 | 7   |
| 626 | 2 D | Macrobenthos              | crabs               | 0.1405 | 7   |
| 626 | 2 D | Macrobenthos              | echinoderms         | 0.0006 | 7   |
| 626 | 2 D | Meiobenthos               | annelids            | 0.5677 | 7   |
| 626 | 2 D | predatory mesozooplankton | gammarids           | 0.0062 | 7   |
| 626 | 3 C | Meiobenthos               | annelids            | 0.9861 | 1   |
| 626 | 3 C | Meiobenthos               | nematodes           | 0.0139 | 1   |
| 628 | 1 A | Epibenthos                | leptostraca         | 0.0001 | 23  |
| 628 | 1 A | jellies/macrozooplankton  | medusae             | 0.0026 | 23  |
| 628 | 1 A | Macrobenthos              | bivalves            | 0.3050 | 23  |
| 628 | 1 A | Macrobenthos              | crabs               | 0.0715 | 23  |
| 628 | 1 A | Macrobenthos              | echinoderms         | 0.0221 | 23  |
| 628 | 1 A | Macrobenthos              | echiurans           | 0.2207 | 23  |
| 628 | 1 A | Meiobenthos               | annelids            | 0.3403 | 23  |
| 628 | 1 A | Meiobenthos               | proboscis worms     | 0.0002 | 23  |
| 628 | 1 A | Microzooplankton          | protozoa            | 0.0054 | 23  |
| 628 | 1 A | predatory mesozooplankton | cumaceans           | 0.0301 | 23  |
| 628 | 1 A | predatory mesozooplankton | gammarids           | 0.0020 | 23  |
| 628 | 1 B | Epibenthos                | barnacles           | 0.0006 | 74  |
| 628 | 1 B | Macrobenthos              | bivalves            | 0.0921 | 74  |
| 628 | 1 B | Macrobenthos              | echinoderms         | 0.0007 | 74  |
| 628 | 1 B | Macrobenthos              | echiurans           | 0.0006 | 74  |
| 628 | 1 B | Meiobenthos               | annelids            | 0.6170 | 74  |
| 628 | 1 B | other fish                | unid fish           | 0.0206 | 74  |

|     |     |                           |             |        |    |
|-----|-----|---------------------------|-------------|--------|----|
| 628 | 1 B | other flatfish            | flatfishes  | 0.0120 | 74 |
| 628 | 1 B | predatory mesozooplankton | amphipods   | 0.0001 | 74 |
| 628 | 1 B | predatory mesozooplankton | cumaceans   | 0.0039 | 74 |
| 628 | 1 B | predatory mesozooplankton | gammarids   | 0.0051 | 74 |
| 628 | 1 B | Shrimp                    | shrimp      | 0.2474 | 74 |
| 628 | 1 C | Macrobenthos              | bivalves    | 0.0185 | 7  |
| 628 | 1 C | Macrobenthos              | echinoderms | 0.1640 | 7  |
| 628 | 1 C | Macrobenthos              | gastropods  | 0.0001 | 7  |
| 628 | 1 C | Meiobenthos               | annelids    | 0.8006 | 7  |
| 628 | 1 C | predatory mesozooplankton | gammarids   | 0.0160 | 7  |
| 628 | 1 C | predatory mesozooplankton | ostracods   | 0.0008 | 7  |
| 628 | 2 A | Epibenthos                | leptostraca | 0.0001 | 11 |
| 628 | 2 A | forage fish               | sandlance   | 0.8408 | 11 |
| 628 | 2 A | Macrobenthos              | bivalves    | 0.0017 | 11 |
| 628 | 2 A | Macrobenthos              | crabs       | 0.0222 | 11 |
| 628 | 2 A | Macrobenthos              | echinoderms | 0.0111 | 11 |
| 628 | 2 A | Macrobenthos              | echiurans   | 0.0213 | 11 |
| 628 | 2 A | Meiobenthos               | annelids    | 0.0869 | 11 |
| 628 | 2 A | predatory mesozooplankton | amphipods   | 0.0147 | 11 |
| 628 | 2 A | predatory mesozooplankton | cumaceans   | 0.0007 | 11 |
| 628 | 2 A | predatory mesozooplankton | gammarids   | 0.0006 | 11 |
| 628 | 2 B | Macrobenthos              | bivalves    | 0.3542 | 6  |
| 628 | 2 B | Meiobenthos               | annelids    | 0.6406 | 6  |
| 628 | 2 B | predatory mesozooplankton | gammarids   | 0.0052 | 6  |
| 628 | 2 C | Macrobenthos              | echinoderms | 0.0578 | 2  |
| 628 | 2 C | Meiobenthos               | annelids    | 0.9056 | 2  |
| 628 | 2 C | predatory mesozooplankton | amphipods   | 0.0183 | 2  |
| 628 | 2 C | predatory mesozooplankton | gammarids   | 0.0183 | 2  |
| 628 | 2 D | Epibenthos                | leptostraca | 0.0002 | 62 |
| 628 | 2 D | Epibenthos                | mysids      | 0.0008 | 62 |
| 628 | 2 D | Euphausiids               | euphausiids | 0.0032 | 62 |
| 628 | 2 D | Macrobenthos              | anomurans   | 0.0000 | 62 |
| 628 | 2 D | Macrobenthos              | bivalves    | 0.0124 | 62 |
| 628 | 2 D | Macrobenthos              | crabs       | 0.0552 | 62 |
| 628 | 2 D | Macrobenthos              | echinoderms | 0.0195 | 62 |
| 628 | 2 D | Macrobenthos              | echiurans   | 0.1448 | 62 |
| 628 | 2 D | Meiobenthos               | annelids    | 0.6999 | 62 |

|     |     |                           |                          |        |    |
|-----|-----|---------------------------|--------------------------|--------|----|
| 628 | 2 D | Meiobenthos               | nematodes                | 0.0000 | 62 |
| 628 | 2 D | Meiobenthos               | proboscis worms          | 0.0237 | 62 |
| 628 | 2 D | other fish                | bony fishes              | 0.0001 | 62 |
| 628 | 2 D | predatory mesozooplankton | amphipods                | 0.0239 | 62 |
| 628 | 2 D | predatory mesozooplankton | cumaceans                | 0.0007 | 62 |
| 628 | 2 D | predatory mesozooplankton | gammarids                | 0.0154 | 62 |
| 628 | 2 D | Shrimp                    | shrimp                   | 0.0000 | 62 |
| 628 | 3 A | Euphausiids               | euphausiids              | 0.0054 | 39 |
| 628 | 3 A | jellies/macrozooplankton  | medusae                  | 0.0054 | 39 |
| 628 | 3 A | Macrobenthos              | bivalves                 | 0.2322 | 39 |
| 628 | 3 A | Macrobenthos              | crabs                    | 0.0260 | 39 |
| 628 | 3 A | Macrobenthos              | crustacea with mandibles | 0.0072 | 39 |
| 628 | 3 A | Macrobenthos              | echinoderms              | 0.0184 | 39 |
| 628 | 3 A | Macrobenthos              | echiurans                | 0.2439 | 39 |
| 628 | 3 A | Meiobenthos               | annelids                 | 0.4507 | 39 |
| 628 | 3 A | Meiobenthos               | nematodes                | 0.0011 | 39 |
| 628 | 3 A | Meiobenthos               | proboscis worms          | 0.0067 | 39 |
| 628 | 3 A | predatory mesozooplankton | amphipods                | 0.0006 | 39 |
| 628 | 3 A | predatory mesozooplankton | cumaceans                | 0.0003 | 39 |
| 628 | 3 A | predatory mesozooplankton | gammarids                | 0.0021 | 39 |
| 628 | 3 B | Macrobenthos              | crabs                    | 0.9824 | 1  |
| 628 | 3 B | predatory mesozooplankton | gammarids                | 0.0176 | 1  |
| 628 | 3 C | Epibenthos                | isopods                  | 0.0004 | 66 |
| 628 | 3 C | jellies/macrozooplankton  | medusae                  | 0.0001 | 66 |
| 628 | 3 C | Macrobenthos              | aplacophora              | 0.0002 | 66 |
| 628 | 3 C | Macrobenthos              | bivalves                 | 0.0688 | 66 |
| 628 | 3 C | Macrobenthos              | cnidaria                 | 0.0007 | 66 |
| 628 | 3 C | Macrobenthos              | crabs                    | 0.0001 | 66 |
| 628 | 3 C | Macrobenthos              | crustacea with mandibles | 0.0006 | 66 |
| 628 | 3 C | Macrobenthos              | echinoderms              | 0.2348 | 66 |
| 628 | 3 C | Macrobenthos              | echiurans                | 0.0021 | 66 |
| 628 | 3 C | Macrobenthos              | gastropods               | 0.0059 | 66 |
| 628 | 3 C | Macrobenthos              | peanut worms             | 0.0005 | 66 |
| 628 | 3 C | Meiobenthos               | annelids                 | 0.6555 | 66 |
| 628 | 3 C | Meiobenthos               | nematodes                | 0.0000 | 66 |
| 628 | 3 C | Meiobenthos               | proboscis worms          | 0.0145 | 66 |
| 628 | 3 C | Microzooplankton          | protozoa                 | 0.0008 | 66 |
| 628 | 3 C | predatory mesozooplankton | amphipods                | 0.0083 | 66 |

|     |     |                           |                          |        |     |
|-----|-----|---------------------------|--------------------------|--------|-----|
| 628 | 3 C | predatory mesozooplankton | cumaceans                | 0.0007 | 66  |
| 628 | 3 C | predatory mesozooplankton | gammarids                | 0.0058 | 66  |
| 628 | 3 D | Epibenthos                | leptostraca              | 0.0001 | 125 |
| 628 | 3 D | Epibenthos                | mysids                   | 0.0000 | 125 |
| 628 | 3 D | Macroßenthos              | bivalves                 | 0.0462 | 125 |
| 628 | 3 D | Macroßenthos              | cnidaria                 | 0.0081 | 125 |
| 628 | 3 D | Macroßenthos              | crabs                    | 0.0029 | 125 |
| 628 | 3 D | Macroßenthos              | crustacea with mandibles | 0.0032 | 125 |
| 628 | 3 D | Macroßenthos              | echinoderms              | 0.0430 | 125 |
| 628 | 3 D | Macroßenthos              | gastropods               | 0.0096 | 125 |
| 628 | 3 D | Meiobenthos               | annelids                 | 0.7886 | 125 |
| 628 | 3 D | Meiobenthos               | nematodes                | 0.0000 | 125 |
| 628 | 3 D | Meiobenthos               | proboscis worms          | 0.0727 | 125 |
| 628 | 3 D | predatory mesozooplankton | amphipods                | 0.0161 | 125 |
| 628 | 3 D | predatory mesozooplankton | cumaceans                | 0.0000 | 125 |
| 628 | 3 D | predatory mesozooplankton | decapods                 | 0.0033 | 125 |
| 628 | 3 D | predatory mesozooplankton | gammarids                | 0.0063 | 125 |
| 631 | 1 C | Macroßenthos              | bivalves                 | 0.9731 | 3   |
| 631 | 1 C | Macroßenthos              | echinoderms              | 0.0260 | 3   |
| 631 | 1 C | Macroßenthos              | gastropods               | 0.0009 | 3   |
| 635 | 3 D | Meiobenthos               | annelids                 | 1.0000 | 1   |
| 636 | 1 B | Epibenthos                | mysids                   | 0.0044 | 103 |
| 636 | 1 B | Euphausiids               | euphausiids              | 0.0033 | 103 |
| 636 | 1 B | forage: fish              | sand lance               | 0.1311 | 103 |
| 636 | 1 B | Macroßenthos              | bivalves                 | 0.0001 | 103 |
| 636 | 1 B | Macroßenthos              | crabs                    | 0.0326 | 103 |
| 636 | 1 B | Macroßenthos              | crustacea with mandibles | 0.0071 | 103 |
| 636 | 1 B | Meiobenthos               | annelids                 | 0.0007 | 103 |
| 636 | 1 B | other fish                | bony fishes              | 0.2041 | 103 |
| 636 | 1 B | other fish                | unid fish                | 0.0754 | 103 |
| 636 | 1 B | other flatfish            | dabs                     | 0.0538 | 103 |
| 636 | 1 B | other flatfish            | flatfishes               | 0.1062 | 103 |
| 636 | 1 B | other flatfish            | sand sole                | 0.0277 | 103 |
| 636 | 1 B | other flatfish            | yellowfin sole           | 0.0093 | 103 |
| 636 | 1 B | predatory mesozooplankton | amphipods                | 0.0031 | 103 |
| 636 | 1 B | predatory mesozooplankton | cumaceans                | 0.0010 | 103 |
| 636 | 1 B | predatory mesozooplankton | gammarids                | 0.0163 | 103 |

|     |     |                           |                |        |     |
|-----|-----|---------------------------|----------------|--------|-----|
| 636 | 1 B | rock sole                 | rock sole      | 0.0825 | 103 |
| 636 | 1 B | shallowwater benthic fish | agonidae       | 0.0013 | 103 |
| 636 | 1 B | shallowwater benthic fish | pricklebacks   | 0.0022 | 103 |
| 636 | 1 B | shallowwater benthic fish | sculpins       | 0.1297 | 103 |
| 636 | 1 B | Shrimp                    | shrimp         | 0.1079 | 103 |
| 636 | 2 B | Epibenthos                | mysids         | 0.0002 | 91  |
| 636 | 2 B | forage fish               | sandlance      | 0.5375 | 91  |
| 636 | 2 B | Macrobenthos              | anomurans      | 0.0000 | 91  |
| 636 | 2 B | Macrobenthos              | bivalves       | 0.0015 | 91  |
| 636 | 2 B | Macrobenthos              | crabs          | 0.0000 | 91  |
| 636 | 2 B | Macrobenthos              | echinoderms    | 0.0036 | 91  |
| 636 | 2 B | Macrobenthos              | gastropods     | 0.0013 | 91  |
| 636 | 2 B | other fish                | unid fish      | 0.2572 | 91  |
| 636 | 2 B | other flatfish            | flatfishes     | 0.0107 | 91  |
|     |     | predatory                 |                |        |     |
| 636 | 2 B | mesozooplankton           | gammarids      | 0.0007 | 91  |
| 636 | 2 B | shallowwater benthic fish | sculpins       | 0.1716 | 91  |
| 636 | 2 B | Shrimp                    | shrimp         | 0.0156 | 91  |
| 636 | 3 B | forage fish               | sandlance      | 0.8383 | 5   |
| 636 | 3 B | Macrobenthos              | crabs          | 0.0652 | 5   |
|     |     |                           | crustacea with |        |     |
| 636 | 3 B | Macrobenthos              | mandibles      | 0.0055 | 5   |
| 636 | 3 B | other fish                | bony fishes    | 0.0450 | 5   |
| 636 | 3 B | Shrimp                    | shrimp         | 0.0460 | 5   |



